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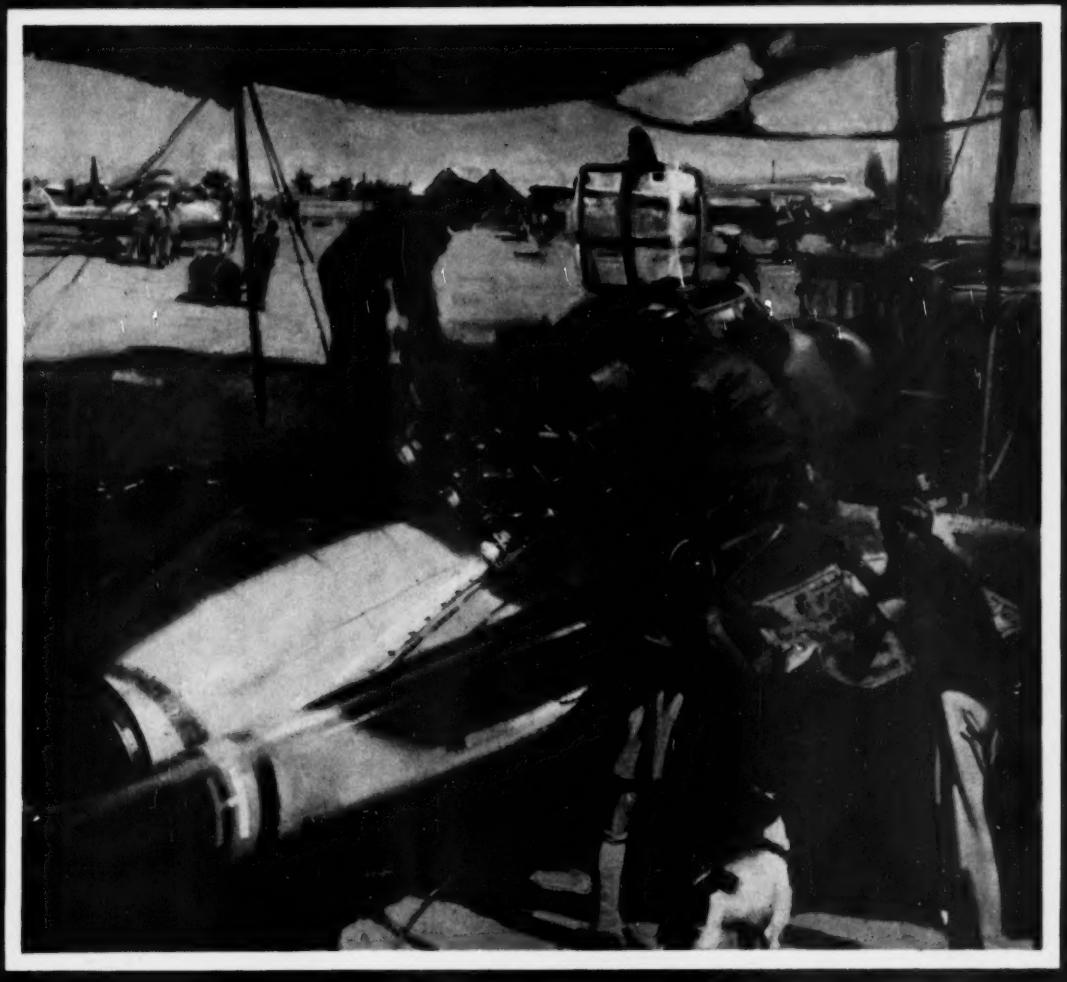

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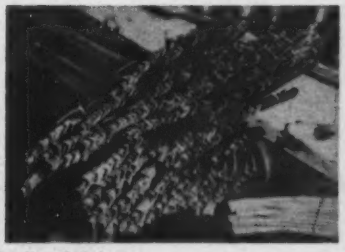

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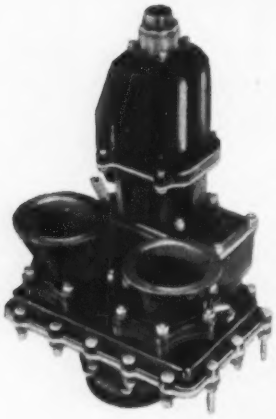

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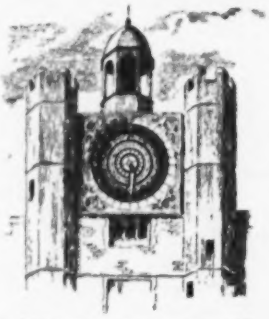

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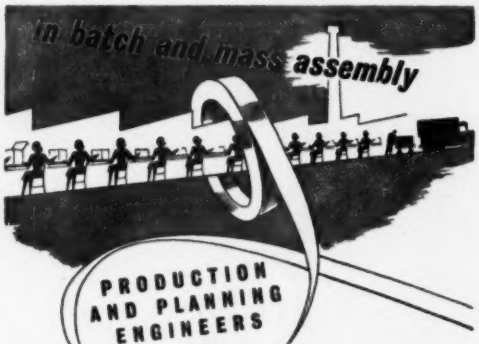

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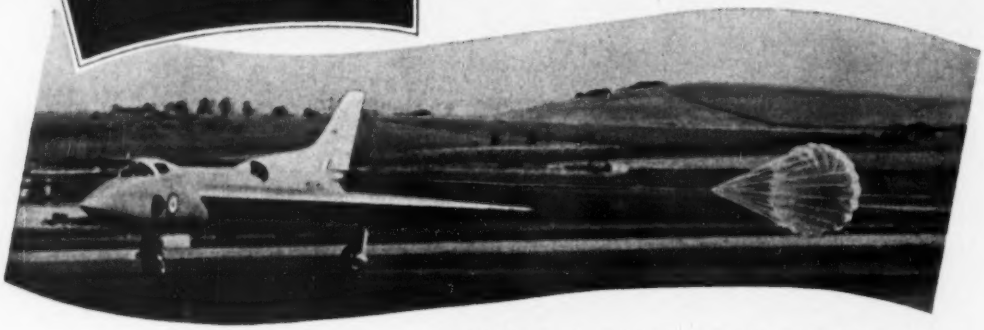

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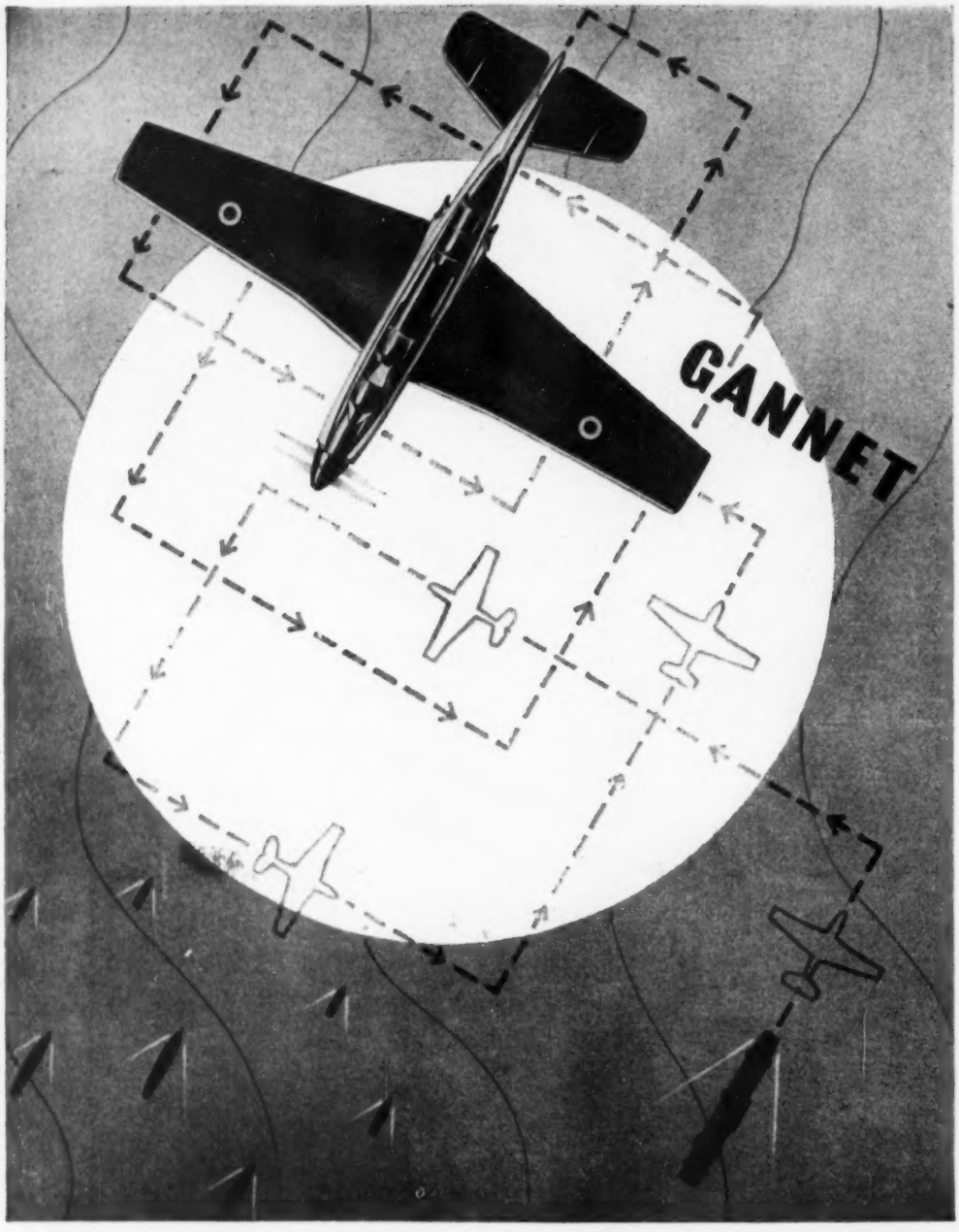

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The Ready

GOOD news of foreign orders for British aircraft continues—during the last week interest has been focussed upon Latin America—and related events have been the flight of the first Canberra from the Belfast production line and the planning of a new Comet line at Chester. It may now be fairly stated that good use is being made of our opportunities, both in securing orders and in making sure of backing them with impressive production arrangements.

But, even so, one obstacle remains: the problem—which exists not only for this country, but for many others abroad—of finding the money with which to buy the aircraft. To reach agreement over requirements and delivery dates is of little value to either party in a transaction if there is no way of finding the money to pay for the goods. There are, of course, various approaches to the problem. Something of a stir was caused, last March, by the announcement that K.L.M. had obtained a 6½-year low-interest loan of seven million dollars from the World Bank to aid them in re-equipping their aircraft fleet. New principles were involved. The loan was guaranteed by the Dutch Government, and half the sum was put up by a private American bank.

Again, according to a recent report, the Germans—who are trying to assemble without delay two fleets of aircraft, one for internal and European routes and the other for overseas services—are now seeking to negotiate a dollar loan with the Export/Import Bank in America to enable them to buy American transports. The choice of an aircraft type may, it seems, become secondary to the method of paying for it. A sterling purchase still raises fewer monetary difficulties in most countries than one involving dollars, but sterling certainly does not grow on foreign trees—though the details of Brazil's £5 million Meteor order suggests that cotton-plants can provide a useful crop of paper money.

It is becoming increasingly apparent that Great Britain must be prepared to back up its aircraft manufacturers if they are to compete on even terms in all and every sort of market. We heard of a case, not very long ago, of a good order for a light aircraft being lost at the last minute because a rival foreign company with government backing was prepared to give away a batch of aircraft in order to secure the future market.

Germany, as remarked above, now requires aircraft for almost immediate use and will probably require others in a year or two's time. Steps should be taken at once to ensure that if British aircraft are suitable and available for the job, they are enabled to do it. Switzerland, among other countries, needs new aircraft; let's see to it at once that lack of ready cash does not prevent these aircraft being of British manufacture. The immediate post-war years, when our industry had little to offer, have been left behind. We have quality and variety and now we can offer quantity. What is more, our prices are significantly lower. The customer can see the goods in the shop window, or already in use by other purchasers; now the Government should be ready to point the way to the entrance.

Basic Fighter

ANY project, be it a poem or a fighting aircraft, may become so overburdened with cumulative elaborations that a fresh start may be the only hope of success. Thus, by reverting to first principles, an aircraft designer may not only change contemporary design philosophy but operational techniques also.

In the intractable problem (as we termed it last week) of air defence it seems that a new approach to fighter design might now pay valuable dividends; thus, the recently announced Folland Aircraft light-fighter project is one which merits the closest attention. That we have in the Hunter and Swift the finest day intercepters, and in the Javelin the pre-eminent night and all-weather fighter, is almost beyond argument; but, due to their very size, weight, power and ever-increasing elaboration of equipment, such machines have become alarmingly expensive both in money and man-hours. In the late war the menace of over-elaboration prompted several new approaches to the problem of fighter design, and these are reviewed in this issue.

Nowhere is the interception problem more acute than in these small, highly industrialized islands, and nowhere could the ultimate solution—the ground-to-air missile—be more advantageously employed. But, until missiles become available, the study of manned-fighter design must be our most earnest concern.

PAVING the WAY

—for Viscount Services: B.E.A.'s "Revenue Research" with Dart-Dakota Freighters

NOT only is the Rolls-Royce Dart the first airscrew-turbine to enter regular airline service, but it is claimed by B.E.A. to be "probably the first aero-engine ever to be brought straight into commercial service without previous military operating experience." Delivery of the Dart-powered Discoveries (as B.E.A. Viscounts are called) is already in progress, and the first scheduled services will begin early in the New Year. Since 1950, however, the Corporation have been accumulating practical experience with the turboprop. In the summer of that year the prototype Vickers Viscount 630 completed a number of passenger-carrying flights on the London-Paris and London-Edinburgh routes. On August 15th, 1951—a Dart-Dakota operated a scheduled freight service between Northolt and Hanover. This flight, the first of its kind, marked the beginning of an extensive Dart development programme, involving regular and *ad hoc* services by two Dart-Dakotas over three routes (Northolt-Brussels-Hanover, Northolt-Amsterdam-Copenhagen, and Northolt-Paris-Milan). Capt. A. S. Johnson is in charge of the Dart Development Unit.

The Corporation's annual report revealed that the Dart-Dakotas had flown a total of 1,173 hr by July 31st, in the course of which they had "provided most valuable experience in turbine operations and uncovered and eliminated defects in the engine and its installation which otherwise would have delayed the introduction of the Discovery." The revenue earned has helped to offset the cost of this vital airborne research work. Significantly, the report also remarked that "enough experience has been gained to show that the man-hours of maintenance required for the Dart engine should be substantially less than for an equivalent piston engine."

The two Dart-Dakotas, as they go about their daily tasks, might easily pass for ordinary Dakotas or Pionairs, of which B.E.A. has nearly 50 in service. The main distinguishing features are, of course, the lengthened, tapered nacelles, which emit a quieter, though higher-pitched, sound; those who study registrations will know also that G-ALXM and G-AMDB identify *Sir Henry Royce* and *Claude Johnson*, as the Dart-Dakotas have been named. B.E.A. acquired them, incidentally, from Field Aircraft Services, Ltd., in 1950; the two airframes have flown about 2,000 hr each, considerably less than most of the other Dakotas in Corporation service. The work of installing the 1,547 e.h.p. Dart 505 turboprops was undertaken by Rolls-Royce, Ltd., at Ministry of Supply expense, in the summer of 1951.

In a recent article in *Esso Air World*, Mr. R. B. Ferris (project and development branch, B.E.A.) outlined the aims of the Dart-Dakota research programme and the results so far achieved. It was possible, he states, to reproduce in the Dakota most features of the Viscount power-plant and control installation, although the cowling was one notable exception. Although the Dart-Dakota is not pressurized, it is provided with a cabin blower, throttled to represent a load equivalent to that anticipated for the Viscount (the heated air produced as a by-product of the throttling being used to heat the cabin). An auxiliary gearbox was fitted to drive ancillaries such as de-icing alternator, generator, hydraulic pump and cabin blower; a permanent oxygen system was incorporated for the crew of three and team of observers; an electric de-icing system was installed on intakes and airscrews; and water-methanol injection was provided to maintain take-off power at high temperatures.

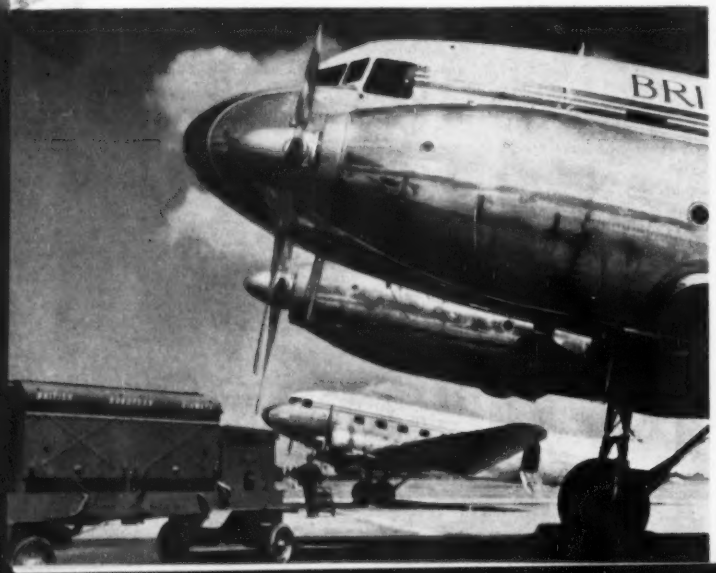
The result of the modifications was an aircraft with a maximum all-up weight of 28,000 lb (equal to that of the standard DC-3 freighter) and a cruising speed of 202 m.p.h. at 25,000ft (corresponding figure for the standard Twin Wasp version, 167 m.p.h. at 7,000ft). The Dart-Dakota's fuel consumption is 119 Imp. gall/hr, compared with 66 gall/hr. Cruising power of the turboprops is quoted as 700 b.h.p., an increase of 150 b.h.p. on the piston-engine's output. No increase was made in the fuel tankage of 670 gall; however, when the laden weight of the aircraft exceeds 24,000 lb a minimum fuel load is imposed in order to counteract larger wing-bending loads, as the installed weight of the Darts is some 14 per cent less than that of the original engines—Pratt and Whitney R-1830-92s.

Mr. Ferris explains the original conception of the Dart-Dakota project in the following terms: "Fuel consumption of the turboprop engine is high even under optimum conditions, and when the engine is being operated at low altitude and low power the consumption rises sharply. Likewise, ambient air temperature is a factor of considerable importance; a small increase in temperature can cause an appreciable drop in power through reduced mass flow and through the lower fuel flow necessary to prevent excessive exhaust temperatures. It follows that new operating techniques needed to be developed for the turboprop." The Dart-Dakota was to give a lead in establishing these techniques for the Viscount.

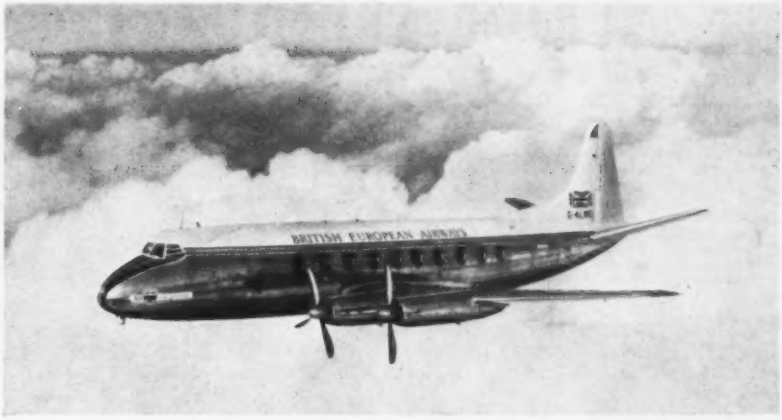
Consequently, a great deal of preliminary theory work was devoted to climb, cruise and in descent procedures. The work of regulating high cruise powers at the required high altitudes was hampered by such difficulties as that of inaccuracy of existing temperature and engine-torque measurements. The resulting operating data, presented in the form of charts, were of necessity more complex than the corresponding data needed for piston-engined aircraft. Since the nature of these charts has been partly determined by the characteristics of the Dart-Dakota airframe, they will not be directly applicable to the Viscount; nevertheless, the general technique has been established and can now be applied to the production of operating data for the Viscount, which it is hoped to present in the form of simple computers.

Comments by Mr. Ferris on the main aspects of Dart Dakota operations to date may conveniently be summarized as follows:—

Rate of descent.—Restricted to 1,000 ft/min for crew comfort, as the Dakota lacks pressurization.

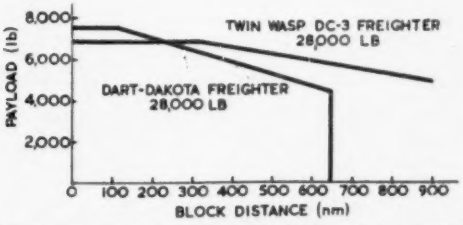


For comparison: Dart-Dakota and Twin-Wasp-powered Dakota (Pionair) on the parking area at Northolt. The starter truck is a 28-volt unit specially developed for turboprops by Murex Welding Processes, Ltd.



Leader of the new generation of turboprop airliners: "Discovery," the flagship of B.E.A.'s fleet of 26 Viscounts, pictured herewith with two Darts feathered. As related on the opposite page, the forthcoming introduction of Viscounts on regular European service will owe much to the preparatory engine-research work done by the Dart Development Unit with its two modified Dakotas. Further development flights are being made with the prototype Viscount 700.

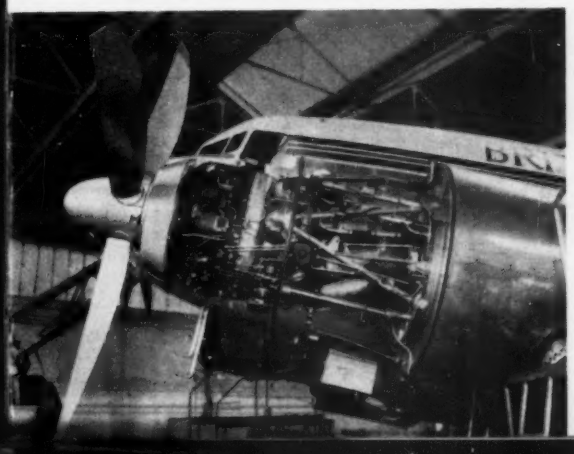
Climb procedure.—Full fuel loads have been carried and steady climbs at constant speeds have been the rule. There has been experimenting with stepped-climb procedures, and these will probably be used in modified form. Climbing speed is 115 m.p.h., compared with 138 m.p.h. for the Twin Wasp version.



Payload-range comparison between Dart-Dakota and the standard Dakota freighter (P. and W. Twin Wasp) used by B.E.A. Allowance is made for 10 kt headwind on climb, 20 kt headwind at 24,000ft (Dart-Dakota's cruising altitude), diversion of 200 n.m. and a 60 min stand-off period. Payload shown for the Dart-Dakota corresponds only to International Standard temperatures.

Engine performance.—The Dart has proved very satisfactory from the maintenance viewpoint and remarkably free from the minor unserviceabilities caused by vibration which plague the piston engines. Accessibility is good and oil consumption is low. High noise-level in the cockpit is due to the proximity of the airscrews, a difficulty peculiar to the Dakota installation.

Increased nacelle-length is the main distinguishing feature of the Dart-Dakota. Here the cowlings are removed to show the light and compact Rolls-Royce Dart 505 (1,547 e.h.p.).



Useful information has also been gathered on the de-icing and water methanol systems; the latter is normally required only for baulked landings or warm weather take-offs on short runways with nearby obstacles, but it imposes a weight penalty on commercial aircraft and its use is being thoroughly investigated.

Some difficulty has been experienced with engine starting at low temperatures and with unfeathering and relighting procedures at altitude. The high rate of wear occurring in generator brush gear is possibly due to high frequency vibration rather than altitude and humidity. These problems are receiving close study and work is proceeding with the suggested solutions.

Taxying.—Normally carried out at 75 per cent of maximum continuous r.p.m. The throttle is used as little as possible in order to maintain steady exhaust temperature for prolonged engine life. Fuel consumption is accordingly high—about equal to that of normal cruising at 25,000ft. The simplified ground-check procedures of the turboprop help to keep ground running and taxying time as low as possible.

Ground handling.—Very little new equipment has been required and the use of kerosine has caused no confusion or difficulty at the various airfields visited so far. For starting, special 28-volt Murex diesel trucks have been acquired, and use of the aircraft's own batteries is confined to transit stops.

Experience with the Dart-Dakota, Mr. Ferris concludes, has made it abundantly clear that turboprop aircraft are an attractive proposition, but it has also shown the need for a clear-headed approach to the related problems—those of air-traffic control, more accurate forecasting at high-altitude winds and others. The Dart-Dakota is an experimental aircraft and its role has been research rather than record-breaking, but in the task of clearing the air for the Viscount its value to B.E.A. has been "inestimable."

SEVENTY METEORS FOR BRAZIL

THE Brazilian Government contract for the purchase of Gloster Meteors, to which we referred in a news-item last week, was duly signed in Rio de Janeiro on October 28th. Representing a sum of considerably more than five million pounds, it calls for the delivery of 60 Mk 8 and ten Mk 7 Meteors. The aircraft will be sent by sea and re-assembled in Brazil by Gloster engineers; the first batch will be delivered early next year, and the order is to be completed within twelve months.

In the words of Mr. P. G. Crabbe, Gloster managing director, these Meteors will be Brazil's first jet aircraft and will constitute the backbone of the Brazilian Air Force. (The fighter force is at present equipped mainly with Republic Thunderbolts.) Other South American countries, added Mr. Crabbe, are "keenly interested" in acquiring Meteors.

The problem of shortage of sterling—discussed in our leading article this week—has been circumvented in the case of the Brazilian order by a reciprocal arrangement whereby Great Britain will buy a considerable amount of Brazilian cotton.

FROM ALL QUARTERS

R.A.F. Sabres

THE Air Ministry announces that, under arrangements which have been made between the authorities of the United Kingdom, Canada and the United States, the Royal Air Force is to receive between 300 and 400 F-86E Sabre fighters. Power plants, electronic equipment and instruments are being furnished by the United States through Mutual Defence Assistance Programme funds. The airframes are being supplied by, and built in, Canada, and the Sabres will be assembled there under Mutual Aid arrangements. Additionally, Canada is providing as Mutual Aid some power plants, armament and electronic equipment, as well as undertaking familiarisation training for the R.A.F. ferry crews.

The main delivery of the Sabres to the R.A.F., it is announced, will begin in December and should be completed during 1953. (Delivery of the first three was completed on October 4th, as described in *Flight* of October 10th.) Under the agreed arrangements the fighters will be employed in the 2nd Allied Tactical Air Force under the command of Air Marshal Sir Robert Foster.

The Sabres are built in Canada by Canadair, Ltd, of Montreal. Although those to be delivered to the R.A.F. will go to tactical squadrons, the sub-type "E", named by the Air Ministry, does not normally carry rocket projectiles or bombs. Provision can, however, be made for 16 R.P.s under the wings. The F-86E, incidentally, is no longer in production in America, having been succeeded in plants of North American Aviation Inc., the originating company, by the F-86D all-weather intercepter, the F-86F day fighter (with 10 per cent more thrust than its predecessors), and the F-86H fighter/bomber.

Attacker Armament and Pressurizing

RECENT reports in the National Press of defects in the Vickers-Supermarine Attacker naval fighter (three squadrons of which are now in service) concern its armament of four 20 mm guns and the cockpit pressurizing. While it is confirmed by the Admiralty that difficulties have been experienced in firing trials at high altitudes and high speeds, and that a temporary restriction has been imposed to cover the contingency, it is stated that for "all normal purposes" the armament is satisfactory.

The "lack of pressurization" which has been mentioned appears to refer to the comparatively low (3.5 lb/sq in) differential pressure in the Attacker's cockpit. This represents a drop in effective altitude to 25,000ft at a height of 45,000ft.

700 m.p.h. Saab

DESIGNATED Saab-32 (Swedish Air Force appellation A-32), Sweden's newest military aircraft is a two-seater intended for attack missions against ground and sea targets. Responsible for the flight tests now under way is Saab's chief test pilot, B. R. Olow.

The Saab-32 is considerably larger than the now-familiar Saab-29 (J-29) fighter and is claimed by the makers to have a top speed in the region of 700 m.p.h. The power plant is a Rolls-Royce Avon, aspirated through flush intakes. The photograph below shows the prominent fairings which smooth the airflow at the root of the movable tailplane, and the whole tail assembly does, in fact, recall that of the North American Sabre, suggesting that the tail may be of the "all-flying" type. The mainplane is more sharply swept than that of the Saab-29 and is fitted with large Fowler-type flaps and leading-edge slots—the latter to improve stability and manœuvrability at the stall. Ailerons and elevator have hydraulic boost; the nosewheel folds forward and the main wheels retract inwards into the fuselage. Under the fuselage nose is a triangular fin, which constitutes one of the aircraft's many antennæ; others are completely submerged. Armament includes cannon, bombs and rocket projectiles, and there is comprehensive electronic equipment for navigation and combat in all kinds of weather and at night.

FOR DEADLY ASSAULT: Saab's new Avon-powered prototype, the A-32, which made a successful first flight last Monday. The pilot was B. R. Olow.

A. Cdre. Sir Vernon Brown.

Mr. Patrick Tweedie.

A. Cdre. Sir Vernon Brown to Retire

THE Ministry of Civil Aviation announces that the Chief Inspector of Accidents, A. Cdre Sir Vernon Brown, C.B., O.B.E., M.A., F.R.Ae.S., R.A.F. (ret.), is to retire at his own request on December 31st, and that the Minister has approved the appointment of Mr. Patrick Graeme Tweedie, O.B.E., at present Deputy Chief Inspector of Accidents, as Sir Vernon's successor.

The retiring Chief Inspector, who is 63 years of age, was educated at Eastbourne College and Cambridge University. He served with the R.F.C. and R.A.F. from 1915 until 1937, when he became Chief Inspector of Accidents in the Air Ministry. He transferred to the corresponding post in the Ministry of Civil Aviation in 1946.

Mr. P. G. Tweedie, who is 50, was educated at Dollar Academy, near Stirling, and Heriot Watt College, Edinburgh. He served a five-year Admiralty engineering apprenticeship and completed his indentures in 1923. In 1925 he was commissioned in the R.A.F. and served until 1930, when he joined Imperial Airways, Ltd., as an aircraft captain. He flew in command on all the European and Empire routes until December, 1937, when he was appointed an Air Ministry inspector of accidents. He transferred to the M.C.A. in 1946 and was made Deputy Chief Inspector of Accidents in that year. Mr. Tweedie holds a Master Pilot's Certificate; an Honours certificate in engineering, Heriot Watt College; and a full certificate in engineering, City and Guilds of London.

Chris Clarkson—Consultant

AN airline, a firm of aircraft constructors and two manufacturers of components—B.E.A., Vickers-Armstrongs, Dowty Equipment and Helliwells—have appointed G/C. Christopher Clarkson, A.F.C., A.F.R.Ae.S., A.F.I.Ae.S., as their technical consultant in the North American area. With headquarters in New York, he will act on behalf of the four organizations, and be available to undertake specific assignments of a technical nature for any of them.

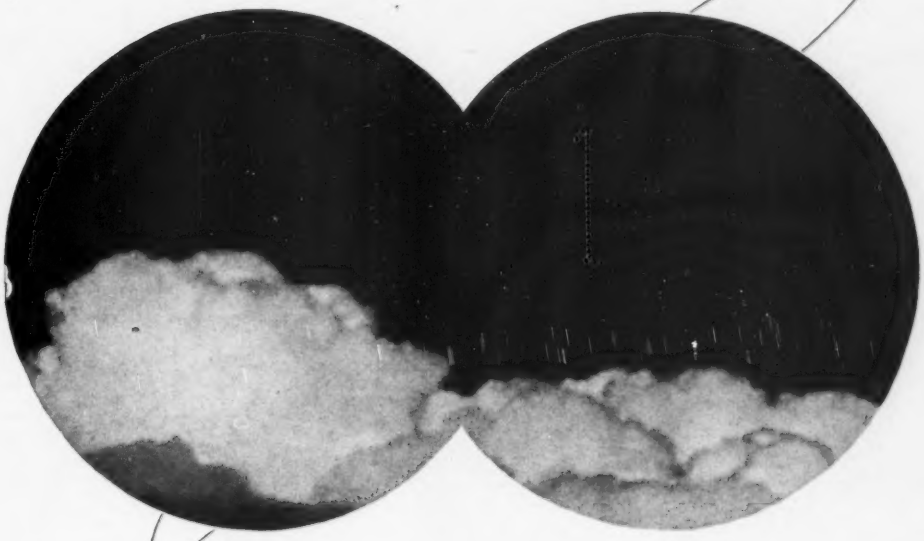
"Chris" Clarkson has been in aviation for 28 years and has gained distinction both as a Service and civil pilot. Joining the R.A.F. in 1924 he served with No. 58 (B) Squadron and subsequently became an instructor at the C.F.S., which was then at Upavon. In returning to civil life in 1929 he filled various aeronautical appointments; from 1935 to 1939 he was aviation manager of the Anglo-American Oil Co.

At the outbreak of war in September, 1939, he re-joined the R.A.F. and, after again serving at C.F.S., went to the United States in 1940 with the British Air Commission, as a member of the East Coast Test and Development Flight. In 1943 he became head of the test branch of the Commission in Washington, a post he held until 1945, when he joined Esso Export Corporation in New York. Shortly after the war, under the *nom de plume* of "Kibitizer," he contributed regularly to the columns of *Flight*.

In February, 1948, G/C. Clarkson was appointed British civil air attaché in Washington, an appointment which he held until last year.

THE YEARS AHEAD . . .

the ever-present consideration of Rolls-Royce



THIS AIR SPACE will be filled in the 1960's by an aircraft powered by a Rolls-Royce engine, which will evolve from the work Rolls-Royce are already doing. The first non-stop Transatlantic Flight, 1919; the winning of the Schneider Trophy outright, 1931; the powering of every fighter in the Battle of Britain; the first Jet Transatlantic Flight without refuelling, 1951; the first double crossing of the Atlantic in one day, 1952; these are achievements which Rolls-Royce helped to accomplish. Encouraged by the past, Rolls-Royce are always looking ahead.

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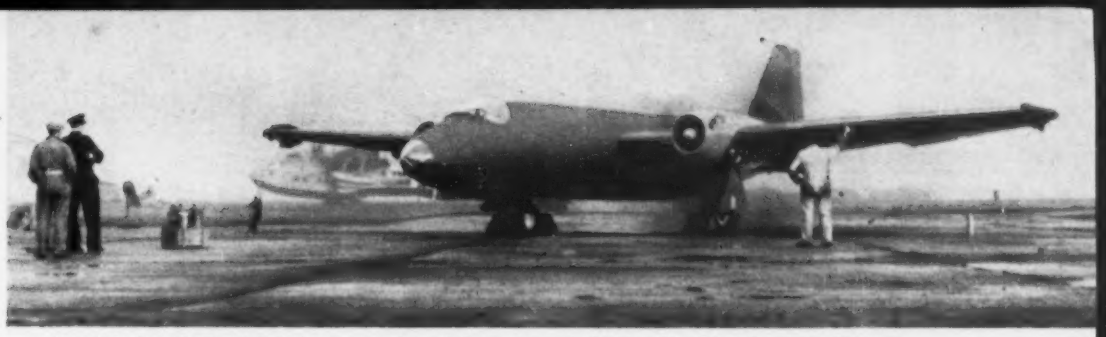


First off the line : The Short-built Canberra is started-up at Sydenham Airport, Belfast, for a 30-minute flight ending at Aldergrove.

FIRST IRISH CANBERRA

—*from Short Brothers' Well-equipped Belfast Factory*

THURSDAY, October 30th, was a memorable day for Short Bros. and Harland, Ltd., for it was marked by the completion and flight of the first Canberra B.2 to emerge from the Belfast production line. The chief test pilot, T. W. Brooke-Smith, after waiting during the morning and early afternoon for a weather improvement, took the machine off from the one—cross-wind—runway now serviceable at Sydenham airfield. (The runways are in course of extension and reinforcement to take Comet 2s in 1953.) After thirty minutes' satisfactory handling the Canberra was landed at Aldergrove. Subsequent Belfast Canberras are now following down the production line and are all to be test-flown and delivered in the same manner, either by the chief pilot or by his assistant W. J. Runciman.

Well deserved congratulations on having produced the first Canberra on time were received by the company from Mr. Duncan Sandys, Minister of Supply. Two years and seven days have elapsed from the time work started. Other companies who laid down Canberra production lines at about the same time—Handley Page and Avro, and Martin in America—have not yet completed their first aircraft. Unlike Shorts, who are producing the whole aircraft in their factories, Martins are arranging to build largely through sub-contractors.

Rear-Admiral M. S. Slattery, the chairman of Short Bros. and Harland, took the opportunity of his announcement of the first Canberra to say something of the extended and newly equipped factories laid down by his company in Belfast. One reason for the early delivery of aircraft was the ordering of some half-million pounds' worth of new machine-tools from various European countries and America in anticipation of production contracts, even though at that time no such contracts were near signature.

In all, there were some 1,300,000 sq ft of factory space available, a new section adding 130,000 sq ft having been built in only twelve months. Some 500,000 sq ft of the factory were available for Comet output, although (Admiral Slattery revealed) at present only fifteen Comet 2s were on order. Eventually the capacity for Comet production could be one per week "without trouble" and including other work and orders.

It was expected that the first Comet 2 would be under test during the summer of 1954. Many units of this aircraft were already to be found in recognizable states around the factory. The de Havilland company had supplied certain other parts, and practically all the necessary jigs and small tools had been made. The Reduxing equipment was already installed. A recent important addition to the factory equipment was a large Hufford stretch-press (see paragraph on page 583).

Not only had Shorts both space and modern equipment available in Belfast, but it was estimated that at least 5,000 more of the city's 40,000 unemployed could be put to work were sizeable production orders forthcoming. Admiral Slattery said that in America plants were often used more efficiently than in this country, and many worked up to 20 hours daily. In this country the average was 8½ to 10, and some men preferred to take other employment rather than work night shifts. However, men were prepared to do night work in Belfast, and Shorts intended to work night shifts in order to increase the rate of production. Admiral Slattery was sure that, given orders of sufficient size, we could produce aircraft in this country as well and as quickly as could be done in America, and at much less cost. He thought a great deal of the American industry but was not afraid of its competition.

As recorded on p. 582, on Thursday of last week the de Havilland company announced that they are starting to lay down a third Comet production line at their Chester factory. It is not known when the first aircraft is expected to be completed, but this line is intended for Comet 3s. At the present time the Belfast Comet line is concerned only with 2s and it seems probable that the initial order of fifteen will be increased before long.

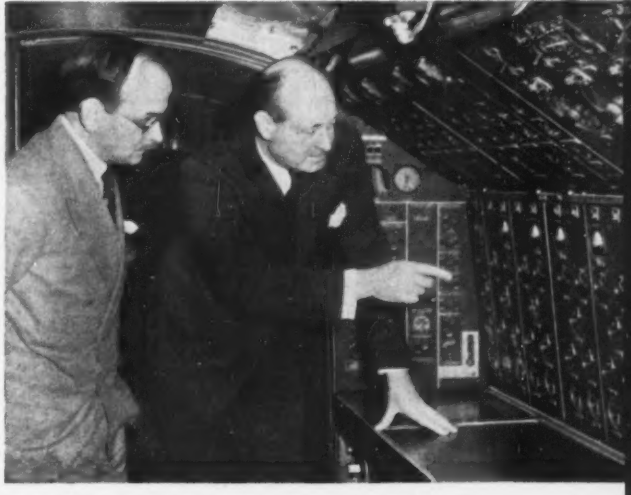
SARO CHIEF DESIGNER RESIGNS

THE announcement was made last week by Saunders-Roe, Ltd., that Mr. Henry Knowler, A.M.I.C.E., F.R.Ae.S., has resigned the position of chief designer, but remains a director (he was elected to the board in 1942).

Mr. Knowler—who is 61 years of age—has been the company's chief designer for no less than 29 years; before that he was assistant designer to the English Electric Co., Ltd., and, earlier still—shortly before World War I—began his aeronautical career with Vickers. Such famous flying-boats as the Cloud, London, S.R./A1 jet fighter and Princess were products of his design-work.

Mr. Knowler is to be succeeded as chief designer by Mr. Maurice J. Brennan, B.Sc., A.M.I.Mech.E., A.F.R.Ae.S., who joined Saunders-Roe at the end of 1936. Mr. Brennan served in most sections of the company's design department until 1948, when he became technical assistant to Sir Arthur Gouge, vice-chairman and chief executive. He has held the position of deputy chief designer since April, 1951.

A few days before this announcement was made, Saunders-Roe, Ltd., had notified two other senior appointments: The Hon M. F. P. Lubbock and Mr. M. D. N. Wyatt have joined the board. Mr. Lubbock is a director of Rolls-Royce, Ltd., and Mr. Wyatt is chairman and managing director of Airwork, Ltd., with which firm he has been connected for the past 18 years.



Handing over: Mr. Knowler (right) at the Princess flight-engineer's panel with Mr. Brennan, who succeeds him as chief Saro designer.

HIGH AND HANDSOME: The U.S. Navy are the fortunate owners of this impressive transport, which represents a notable step forward in speed and economy over previous American designs. Designated R7V-1 it is, in effect, a military Super Constellation, powered by Wright Turbo-Compound engines. Seating 106 and cruising at over 300 m.p.h., it approaches Bristol Britannia performance; and the turboprop R7V-2 will be even faster.

HERE AND THERE

Royal Visit to Cambridge

ON Thursday next, November 13th, H.R.H. the Duke of Edinburgh is to open the new wing of the Department of Engineering at Cambridge University.

Coronation-year "Farnborough"

THE date of next year's Farnborough Show has already been announced by the S.B.A.C.: It will take place from September 7th to 13th.

Conway Inquiry

IN a written Parliamentary reply, on October 27th, Mr. Duncan Sandys, Minister of Supply, said that the circumstances in which details of the Rolls-Royce Conway engine appeared in an American magazine before the unit was taken off the secret list were being investigated.

Mystery No Longer

FIRST French aircraft to fly faster than sound is the Dassault Mystère II (Hispano-Tay)—one of a pre-production batch of 12. It appears that when, on October 28th, it first surpassed Mach 1 the pilot was Col. Marion Davis, of the U.S.A.F. Flight Test Centre.

Korean Air Activity

DURING one day of the intensified ground fighting in Korea—November 27th—United Nations aircraft flew 48 close-support sorties in the Panmunjom area, using napalm, rockets, and bombs. Another 144 sorties were made against supply columns in the rear areas.

The One That Got Away

AT Gatow airfield, Berlin, R.A.F. lorry drivers tried to prevent the pilot of a Russian Mig-15 fighter from taking off after it had landed, apparently by mistake. The incident occurred on October 24th and a newspaper report says, a little oddly, that the authorities "are seeking ways of preventing similar 'invasions.'"

M.o.S. Appointment

WHEN Sir Harry Garner retires, early next year, from his post of Chief Scientist, Ministry of Supply, he will be succeeded by Dr. Owen H. Wansbrough-Jones. The new chief—who will be responsible for the co-ordination of all M.o.S. scientific research and development other than that concerned with atomic energy—has been Principal Director of Scientific Research (Defence) since January 1951.

The Goodwill Mission

ON October 28th, three of the Canberras of the R.A.F. South American goodwill mission—the fourth was temporarily grounded after hitting a vulture in Brazil the previous week-end—arrived at Montevideo, Uruguay, gave a display, and went on to Buenos Aires on the 30th. On the following day—Friday last—they were demonstrated at Ministro Pistarani before the Argentine Air Minister, the British Ambassador, and a number of senior officers; one flew low over Government House in salute to General Peron, who was unable to attend the display. On Saturday the aircraft took off for Santiago, Chile.

Ferranti and Missiles

IN his annual report, on October 29th, Sir Vincent de Ferranti, chairman of Ferranti, Ltd., spoke of a guided missile project with which his company is concerned. In the course of his remarks he said, "Our contribution towards the development of guided missiles is considerable."

Bristol 173 Prototypes

IN the House of Commons, on October 27th, the Minister of Supply said that two prototypes of the Bristol 173 helicopter were now complete and flight tests were proceeding. He had recently placed orders for three further prototypes incorporating "various improvements." Production plans would depend on what orders were received by the firm.

Third Comet Production Line

A STATEMENT on Comet production plans, made by de Havillands last week, says that some component manufacture is already in hand at the large D.H. factory at Broughton, near Chester, as it is also at the company's other plants in the north and south of England. The work at Chester will expand in pace with demand and plans are being developed in readiness for the starting of a Comet production line at Chester; this will be additional to the existing lines at Hatfield and Belfast.

In Memory of Rex Pierson

A TRIBUTE will be paid to the memory of a pioneer aircraft designer when, on Wednesday, November 12th, the first R. K. Pierson Memorial Lecture will be given before members of the R.Ae.S. (though a "main" lecture, it will take place at the Society's Weybridge branch, at 6 p.m., in the Vickers-Armstrongs works). The lecturer will be Sir A. H. Roy Fedden, M.B.E., D.Sc., F.R.Ae.S., and his subject will be "Rex Pierson—An Appreciation and the Lessons of His Work." Rex Pierson, who died in January 1948, was Vickers' chief aircraft designer until 1946. After first joining the organization in 1908, he had risen to that post in 1917, and was responsible for such famous types as the Vimy, Wellesley, and Wellington (the two latter embodied B. N. Wallis's geodetic construction system).

Westland Results

THE directors of Westland Aircraft, Ltd., announce a group profit of £78,345 for the year ended June 30th, 1952. A dividend of 5 per cent, free of tax, is recommended.

Finnish Orders Reported

A REPORT from Finland says the Defence Ministry is to purchase three D.H. Vampires and that the Ministry is also negotiating the purchase of an unknown number of Gloster Meteors and six Percival Princes.

Sealands for Bengal

TWO Sealand Mk I amphibians (D.H. Gipsy Queen 70-4) have been purchased by the Government of East Bengal for communications duties with the Provincial Transport Commission. Each equipped to carry five passengers in "executive" comfort, the aircraft will be based at Dacca, where the airport already houses a Sealand operated by Ralli Brothers, the big firm of exporters and importers. Delivery of the two machines is expected early next year.

Rotol Acquire British Messier

JOINTLY owned by Rolls-Royce, Ltd., and the Bristol Aeroplane Co., Ltd., the firm of Rotol, Ltd., has acquired all the shares in British Messier, Ltd., the well-known undercarriage and hydraulics manufacturers. Lord Hives has been appointed chairman of the board of British Messier, Ltd., the remaining directors of which will be Mr. W. R. Verdon-Smith (or alternatively, Mr. W. Masterton) of the Bristol Aeroplane Co., Ltd.; Lt.-Gen. Sir John Evetts, managing; Mr. L. S. Armandias, deputy managing; and Mr. H. G. Conway, technical. These arrangements took effect on November 1st. Each company will continue trading as at present, but a measure of co-ordination will be effected in the works organization. The registered office of both companies will in future be located at Cheltenham Road, Gloucester (telephone number, Gloucester 24431).

"Teddington" Dinner

FOLLOWING the R.Ae.S. section lecture on *Temperature Control in Jet-engined Aircraft* given by Dr. E. W. Still on October 30th (and summarized on pages 595-596) an informal supper-party was given by Teddington Controls, Ltd. (of which firm Dr. Still is research and development manager) at a London hotel. Present were representatives of several leading aircraft and equipment manufacturers, and in the chair was Mr. W. F. F. Martin-Hurst, managing director of Teddington Controls. The after-supper speeches almost all featured the theme of "simplification," which had been raised during the questions following Dr. Still's lecture; and on this note a general discussion followed.

CANBERRA

A shield against aggression

Canberra — first to fly the Atlantic twice in one day.

Canberra — chosen for the R.A.F., R.A.A.F., U.S.A.F.

Canberra — designed and built in Britain.

This aircraft is also in production in Australia and the United States. It has already broken many records flying between Britain, the U.S.A., Africa and Australia.

'ENGLISH ELECTRIC'

The Canberra is powered by Rolls Royce Avon engines

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'When it's a question of gallons' said the Friesians smugly, 'they hang red rosettes round our necks!' The Jersey stopped chewing for a moment and said something that sounded like 'Butterfat'.

'When it's a question of knots' said a number of swept-back aircraft, 'we're very fast little fighters'. The Swift happened to be passing and as the others turned for home it radio'd back, 'It's a question of gallons!'

THE **SWIFT** GOES FARTHER—JUST AS FAST

VICKERS-ARMSTRONGS LIMITED · SUPERMARINE WORKS

HERE AND THERE . . .

Pressing On

PACKED in a single case, a Hufford press weighing 75 tons and costing some £100,000 recently arrived in Belfast from California, consigned to the Newtownards aircraft factory of Short Brothers and Harland, Ltd. The conveyance of the big machine-tool from the docks to the factory raised some acute transport problems. (A note on Belfast production of Canberras and Comets appears on an earlier page.)

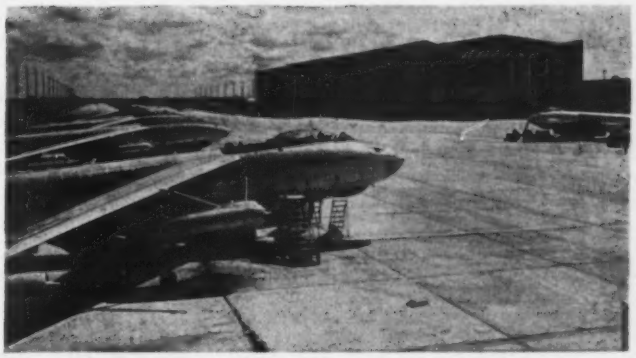
Eagerly Awaited

THE U.S. NAVY announced last week that the prototype Douglas A3D has carried out its initial test flying at Edwards Air Force Base, California. The A3D—as yet unnamed—is one of the largest aircraft ever designed for carrier operation; powered by two podded Pratt and Whitney J-57 turbojets, it can carry a very heavy offensive load farther and at higher speeds than any other aircraft of its size. With a crew of three, the A3D is expected to see action as a low- and high-altitude strike aircraft, operating without escort.

STICKER: Printed in three colours, this attractively designed little reminder is appearing on letters sent out by the makers of the aircraft.

Good-Time Tour

IN co-operation with travel agencies, B.O.A.C. is offering American visitors a 12-day tour which, for about £180, includes transportation from New York to London and back by the "off-season" Constellation tourist service, visits to places of interest in the capital and the provinces, stalls for seven London theatre performances, and membership of a well-known supper-and-dance club. The offer is available from November to March, and a shorter version of the tour is also available.



MORE THAN 300 Boeing B-47 six-jet bombers have been completed to date, according to the U.S. Under-Secretary of the Air Force. In this recent view from the Boeing company's Wichita plant between 20 and 30 of these bombers are seen arrayed before delivery. The B-47 has an officially declared take-off weight of 185,000 lb. and the top speed is "more than 600 m.p.h."

IN BRIEF

THE Plessey liquid-monopropellant-fuel starter for gas turbines is to be manufactured under licence in America by the Hamilton Standard Division of United Aircraft Corporation.

* * *

The Aerauto Association (former students of the Chelsea College of Aeronautical and Automobile Engineering) holds its reunion dinner at Ye Olde Cock Tavern, Fleet Street, tomorrow, November 8th. Tickets (12s 6d) from the hon. secretary at 102, Sydney Street, London, S.W.3 (Flaxman 0021).

* * *

Western Manufacturing (Reading), Ltd., The Aerodrome Reading, Berks, have produced a handsome and informative catalogue of their actuators and other aircraft components. Durably bound in artificial leather, it is in loose-leaf form, and amendments will be circulated when new items are added to the range, or existing ones modified.

* * *

Director-Engineer M. Djuric, the technical director of Yugoslavia's aircraft industry, accompanied by his deputy, Eng. K. Brkovic, and other officials, has recently been visiting British factories. In the photograph below he is being shown a Dynamatic coupling at the Worcester works of Heenan and Froude, Ltd., makers of gas-turbine and other test equipment; he also visited an associated company, Fielding and Platt, Ltd., whose hydraulic presses are extensively used in the aircraft industry.

* * *

Bowthorpe Holdings, Ltd., Tinsley Lane, Crawley, Sussex, announce that they have purchased the entire shareholding of Cheltenham Plastics, Ltd., and will now be able to offer a wide range of P.V.C. extrusions (including tubing) in addition to the injection mouldings and tubing made by their subsidiary company, Hellerman, Ltd.

* * *

A group of metallurgists is now in the United States to study magnesium-industry productivity under the auspices of the Organization for European Economic Co-operation. The secretary of the group is Dr. John L. Haughton, consultant to Essex Aero, Ltd., Mr. E. F. Maillard, chief metallurgist of the same company, is the only other English member of the team. Every magnesium plant of major importance in the Eastern States will be visited.

INTERESTED: Caught by the camera during the Yugoslavian officials' visit to Heenan and Froude, Ltd. (see paragraph above): left to right, Eng. K. Brkovic; M. Lazovic, Yugoslav Import Co.; Dir.-Eng. Djuric; Mr. A. Walker, H. and F. overseas sales manager; Mr. K. May, director of Guests Industrials, Ltd.

THE AIR MINISTER, Lord de L'Isle and Dudley, recently visited the Bristol Aeroplane Company's works. He is seen with test pilot P. Wilson (right): they are discussing rotor-blade construction.

Can the Airlines Use the Helicopter?

Piasecki Executives on Present and Near-future Possibilities

BELOW is a shortened version of a paper, under the above title, by F. N. Piasecki and L. S. Wigdortchik (respectively chairman and special projects engineer of the Piasecki Helicopter Corporation), presented at the National Aeronautic Meeting of the Society of Automotive Engineers, which was held in Los Angeles, California, from October 1st to 4th.

DURING the past 10 years helicopter development has been continuous, and the machine is now widely accepted as being capable of performing essential and diverse tasks. Present values of cruising speed, range and payload are twice, six times and almost 15 times respectively as large as those at the beginning of this period. The impetus of military requirements has made these improvements possible. Previously-assumed limitations on speed and size of helicopters have proved fallacious, and prototype helicopters of more than 30,000 lb gross weight now exist.

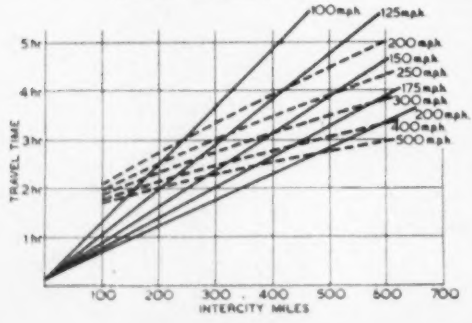
Operationally, the progress has been equally striking. Scheduled mail services have been operated for the last five years, with high reliability, and experimental passenger services in the U.K. have demonstrated well the future possibilities; further research into this aspect is still necessary, however. Future development will depend on the requirements stated by the operators: these, in turn, will depend on the amount of planning and operating experience which can be gained in the immediate future. An analysis of representative multi-engined helicopters which could become available before 1960 shows, in the near future, payloads up to 4,100 lb at speeds up to 125 m.p.h., and later on, a 52-seat design with an 11,200 lb payload at 140 m.p.h. By 1960, a 40-seat machine with 9,200 lb payload at 200 m.p.h. is possible, all these performances being based on a 200-mile stage length.

The Rôle of the Helicopter

The use of the helicopter is advantageous on short-haul routes for four main reasons. Firstly, there is the speed advantage: due to the travelling time between city centre and airport, and to delays at the airport, it is only over long stages that the effect of a conventional aeroplane's high cruising speed is felt. A comparison of cruising speeds, allowing for operational procedures, has formed the basis for the diagram (Fig. 1) which shows the helicopter's short-haul advantage in terms of time saved. Secondly, the inter-city traffic potential is high; passengers and freight can be attracted both from the conventional aeroplane and from the automobile over short routes, and heavier traffic in general will be stimulated. Thirdly, the helicopter could be used to provide connections with trunk-line air services on an increased scale, and lastly, the increasing congestion at main airports could be reduced by using helicopters, operating from separate heliports, for short-haul traffic.

An obviously important question is that of helicopter operating costs. Cost formulae such as those of the A.T.A. are not strictly applicable, but some of the basic factors in helicopter operating economics may be studied. The initial cost will probably be higher per passenger seat than that of an airliner, but the type will be capable of higher utilization. No major difference in depreciation rates is probable, and higher insurance rates for the helicopter would be required only in the early stages of its use. The early helicopters have required a rather high number of maintenance man hours per flying hour, but this rate should soon stabilize at a figure comparable to that of a conventional airliner. With equal capacity payloads, the helicopter's productivity, measured in capacity ton-miles per hour, will be more than that of the aeroplane up to 100-mile stage-lengths, but less above this distance. The duplication of traffic staffs at town centres and airports for fixed-wing aircraft is unnecessary for the helicopter, with consequent cost reductions; in addition, heliports are cheaper than airports to operate.

Fig. 1. *Travel time between city centres, for aeroplane and helicopter, (solid line) at various cruising speeds.*



These considerations imply that direct operating costs per ton mile will be higher for the helicopter than for the aeroplane, but that the indirect costs will be lower: direct costs are 61 and 50 per cent of total costs respectively. These costs must be related to the fare structure. Although the average basic fare rate for short-haul aeroplanes is 6.8 cents, plus tax, per passenger mile, the addition of airport transport charges produces an average overall fare rate between city centres as high as 8.8 cents at distances of 100 miles. It is felt that large helicopters (having more than 40 seats) can be operated within this cost range.

The question of safety is also of vital importance. Experience has shown that freedom from mechanical failure is dependent on the same factors as for aeroplanes, and high standards of maintenance and prototype testing have ensured that the helicopter's failure rate is no greater than that of the conventional types of aircraft. The slow speeds of the helicopter during approach, take-off and bad weather flying have decreased the chances of accidents, and a high intrinsic safety record is thus possible. Regularity and punctuality can be provided by the helicopter, which, being able to fly slowly and to stop if necessary, could operate to lower I.F.R. minima, and thus improve on the present airline regularity and punctuality. In addition, the factors of convenience and public acceptance favour the helicopter.

Some Operational Problems

Fundamental performance requirements of the helicopter are already fairly well understood, but many operational aspects must soon be clarified if the corresponding requirements are to be embodied in this first generation of transport helicopters. The problems include :—

The All-weather Flight Problem.—An experimental flight programme to establish techniques and to provide equipment making possible all-weather helicopter operation has been proposed. It has been shown that existing helicopters can be flown under completely blind conditions, given adequate instrumentation, but the limiting factor would be in this case pilot fatigue. New air-traffic control rules are necessary, defining separate low-altitude traffic patterns for helicopter operation. The "line of sight" disadvantage of present-day V.H.F. radio navigation systems must be overcome for their use in helicopters to be practicable. G.C.A. and I.L.S. would prove too expensive for the heliports of small towns and, indeed, the helicopter's slow approach speed makes less elaborate equipment adequate: an unmanned radio beacon, transmitting an approach cone at the optimum approach angle, might be a suitable aid. More detailed weather information would be desirable for high regularity.

From a full understanding of the above problems will come the definition of practical terminal minima, such as the suggested 200ft ceiling and 500ft visibility in certain cases. Heliports should preferably be unmanned as regards operations and control, all aids being automatic; and airborne lighting and flares should be carried to ensure safe emergency landings en route.

Partial Power Safety and Take-off Area Requirements.—The full power of a twin-engined helicopter amply covers all flight power requirements but, with one engine inoperative, height can be maintained only through a much reduced speed range. The proposed C.A.A. take-off requirement is for a climb gradient 1 in 20 at best forward climb speed on one engine, and Fig. 2 shows how this requirement determines the minimum level flight speed, thus controlling the take-off method. In Fig. 3 are shown alternative take-off techniques, requiring 1,000ft and 400ft take-off lengths respectively, and the extent of payload penalty in connection with partial power safety is shown in Fig. 4. Practical study of the problem is essential for sound development.

Passenger Accommodation.—On stage lengths of 10-100 miles, lower accommodation standards than those between 100 and 400 miles may be acceptable. This would enable an increased number of seats to be fitted, and the full payload benefit to be realized. Flexibility of seating accommodation is also necessary, however, to suit day-to-day conditions, and the "European rail coach" concept of a sub-divided fuselage, or the removable freight or passenger capsule, may be favoured.

Traffic and Ground Handling Techniques.—Because the helicopter

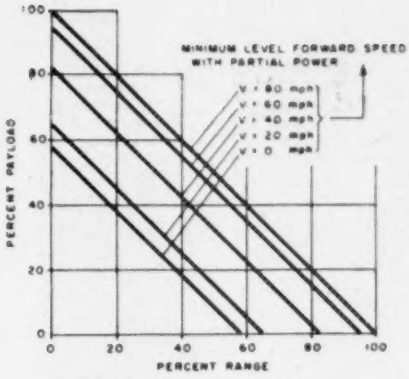


Fig. 2. Partial-power speed range for conventional multi-engined helicopter assuming C.A.A. requirement.

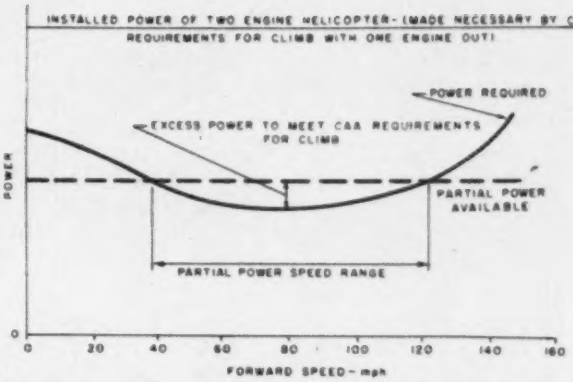

INSTALLED POWER OF TWO ENGINE HELICOPTER - (MADE NECESSARY BY CAA REQUIREMENTS FOR CLIMB WITH ONE ENGINE OUT)
POWER REQUIRED
EXCESS POWER TO MEET CAA REQUIREMENTS FOR CLIMB
PARTIAL POWER AVAILABLE
PARTIAL POWER SPEED RANGE
POWER
FORWARD SPEED - mph

Fig. 4. Performance penalty of partial-power flight requirements (partial power = 50 per cent of installed power) for a hypothetical but conventional mechanical-drive helicopter.

is a flexible short-haul vehicle, the time spent on the ground at stops must be minimized. The helicopter passenger must be self-sufficient to a degree approaching that of the railroad passenger. Traffic documentation must be reduced and some relaxation of the tedious and costly system of reservations currently used with aeroplanes is essential. No ground handling equipment should be required; ease of re-fuelling and loading, and speedy embarkation of passengers are vital factors for economic operation.

Integration of Aeroplane and Helicopter Operations.—The essential link between aeroplane, trunk services and helicopter short-haul services will take place at airports. It will be essential that their traffic patterns are independent of each other in order that neither class of operation imposes delays on the other. The position of the helicopter landing area at major airports is important: the disembarking passengers must find themselves within walking distance of the airline check-in counter if the helicopter is to offer the same convenience as a coach and if the whole operation is to be smooth and simple. The helicopter will thus have to operate from the central point of the airport, and the associated problems of control and flight procedure will have to be resolved.

Noise.—Operating helicopters into cities will introduce new problems concerning noise. It is considered that engine noise may be the critical factor, particularly when shaft turbines are used, and some degree of silencing will be mandatory.

Problems of Heliport Design.—Major considerations in heliport design are position, traffic, operating techniques, size, construction and, not the least, cost, which must be considered in relation to all of these points. Position is controlled by the need to possess good communications with all the traffic generating area to be served. It will be best to use ground sites initially until further knowledge is gained, yet surrounding obstruction and desired position may leave no alternative but a rooftop site, involving consideration of concentrated loadings and other special construction features. The heliport size is largely controlled by partial power emergency landing procedures.

Flight Standardization Between Heliports.—Since the helicopter will serve a greater number of communities than present aeroplanes local regulations concerning flight over the built-up areas must be studied to establish standardization and precedents for future operations. Care must be taken to ensure the best possible flight lanes over built-up areas from the aspect of nuisance factor and safety.

Establishing Design Requirements

From the stand-point of transportation service to be provided by the airlines, questions of the following type must be resolved before a helicopter specification can be written: Over what type of routes will the helicopter be operated? What economic performance is required? What operational procedures and allowances will be employed? What other operational equipment is required? What turn-round technique will be employed?

From the answers to the above, the following type of questions must be further resolved: What are the performance requirements? What safety criteria will be required? What take-off and landing techniques will be employed? What cockpit layout will be required? What types of seating, baggage, galley, toilet will be needed? What will be the comfort standards? What maintenance characteristics are required?

There is no doubt that the best way to study these problems is through actual experience from the operation of experimental services, as has been done by B.E.A. in preparing their detailed specification for a transport helicopter.

A Programme of Development

The following phases of work are suggested in an overlapping sequence as a development programme:—

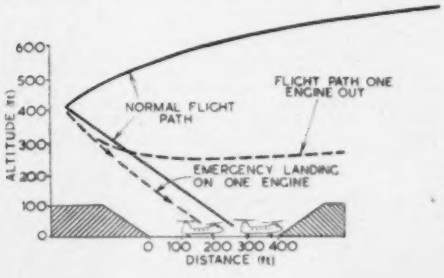
Phase A: Further experimental flight operations to determine operational methods, facilities and requirements.

Phase B: Design and construction of passenger and freight heliports both in cities and airports; introduction of ground and operational facilities.

Phase C: Experimental passenger services to prove route systems and techniques.

Phase D: Introduction of regular passenger services on short-haul routes.

Conclusions.—(*a*) Large transport helicopters capable of shouldering a high proportion of airline traffic can be available for airline operation after 1956; (*b*) the transport helicopter of this decade will be able to offer a superior service to the inter-city traveller than that which is at present available with the aeroplane, over block distances up to 350 miles; (*c*) the short-haul transport helicopter in complementary operation with the trunk line aeroplane will further accelerate the growth of all air traffic by bringing the speed of air travel to a much greater number of communities and people; (*d*) widespread development of short-haul helicopter services will enable many of the serious problems of airport and aeroplane operation to be greatly alleviated; (*e*) in view of the above, the airlines should include the transport helicopter in their present planning; (*f*) co-operation between the helicopter industry, the airlines, government and city authorities is needed to provide the operational methods, facilities and requirements to meet the availability of the first large transport helicopters.



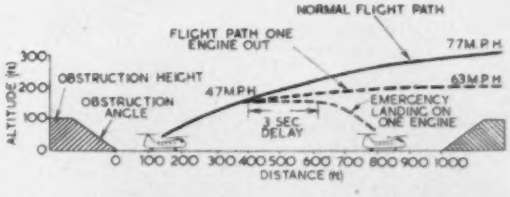


Fig. 3. Safe take-off procedures and effect on heliport dimensions, assuming partial-power performance to meet C.A.A. requirements: (right) forward take-off and (left) backward take-off.

Powered by the 190 h.p. Lycoming O-435-A flat-six, the Sk 50 (the Safir in military-trainer form) has a top speed of 171 m.p.h., cruises at 152 m.p.h. (75 per cent. power), and has a range of 650 miles. Weight empty is 1,580 lb and, loaded, 2,560 lb.

BUILDING the SAFIR in HOLLAND

De Schelde Returns to Aircraft Manufacture

WHEN, some months ago, the Svenska Aeroplan Aktiebolaget, generally known as Saab, revealed the fact that the substantial numbers of Type 91B Safir basic trainer ordered by the Swedish Air Force would be built under sub-contract by the De Schelde shipbuilding firm, which also operates an aircraft factory at Dordrecht, near Rotterdam, the announcement signified the welcome return to the aeroplane manufacturing field of a Dutch company well-known in the immediate pre-war years for the originality and diversity of its aircraft designs.

The possibility of finding a sub-contractor for Safir production was first considered by Saab over three years ago, when the Swedish Air Force began to evince interest in this attractive little aeroplane as a potential replacement type for the elderly Bücker Bestmann. It was foreseen that Saab's existing military commitments would preclude any quantity production of the Safir should large-scale orders be placed and, as no suitable Swedish sub-contractor presented itself, the De Schelde company was approached, discussions commencing in August, 1949.

The aircraft division of De Schelde had been established in 1935 at Flushing, taking over the aircraft division of Pander and Zonen, together with the chief designer, Ir. T. E. Slot, and most of the personnel. A successful pre-war series of De Schelde designs followed, but between 1945 and 1951, aeronautical activities were limited to the production of sheet-metal parts for Fokker, Dakota overhaul and conversion for a French company, the production of a series of E.S.G. metal primary gliders for the Royal Dutch Aero Club, and the overhaul and repair of trainers for the *Rijksluchtvaartschool*. Facilities for the quantity manufacture of complete aircraft at Dordrecht were extremely limited and, early in 1951, constructional work began for a new assembly hall providing an additional 45,000 sq ft of floor space.

Agreement between Saab and De Schelde was reached and a contract was signed on June 18th last year. The contract called for the manufacture of an initial batch of seventy-five Type 91B Safirs and gave an assurance for future production after the completion of the initial order. The first Safir drawings had been received by De Schelde in May, but a number of equipment changes were demanded in the military basic-trainer version, notably in the radio equipment and instrumentation, and some detail design work had to be undertaken in the drawing office at Dordrecht.

With the arrival of jigs and tooling from Sweden, a start on Safir production was made in October, and the first machine was delivered on July 2nd last, little more than a year after the contract had been signed, when it was flown from nearby Ypenburg airfield to Linköping by Bengt R. Olow, Saab's chief test pilot. This machine, like the majority of the initial production batch, is a military basic trainer, designated Sk 50 by the Swedish Air Force. A civil trainer variant, ordered for Sabena's recently established pilot training school at Melsbroek, will also be built at Dordrecht, and the drawing office is currently working on the design of a new four-seater version of the Safir; a mock-up is under construction. The major change in the layout will be the transfer of the fuel tank, at present located in a bay aft of the port-side front seat, to the wings; this will allow room for the additional seat.

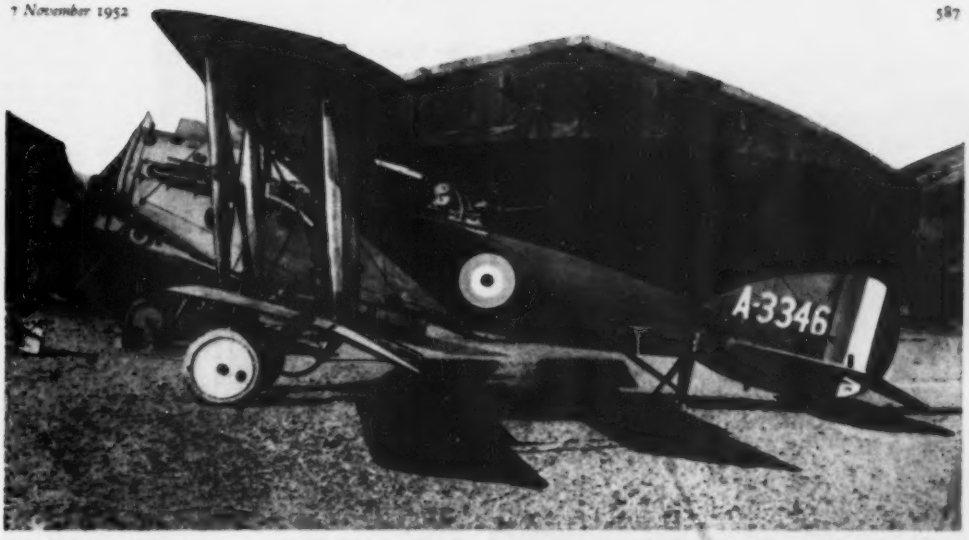
At the time of the writer's visit to the Dordrecht factory, roughly two-thirds of the floor space of the new assembly hall had been taken up by Safir production and two assembly lines had been established. Some fifteen Safirs were in various advanced stages of construction and major components for a considerable number of additional machines were to be seen. The second Sk 50 Safir was in the spray shop receiving its yellow overall finish and Swedish military insignia, and this machine has since been flight-tested. Production tempo is building up to a delivery rate of six aircraft per month and it is anticipated that this target figure will be reached in December. Of some 500 personnel currently employed at Dordrecht roughly 130 are engaged solely on Safir production, but this number will increase with the expansion of the assembly lines.

Basic constructional features of the Lycoming-powered De Schelde-built Safir are similar to those of the earlier Type 91A and are therefore well known to readers. The main change between the types 91A and B is, of course, the replacement of the 145 h.p. Gipsy Major 10 by the flat-six 190 h.p. Lycoming O-435-A. This drives the Hartzell v.p. airscrew, and a noticeable feature of the engine installation is the extreme accessibility provided by the new petal-type cowling. Other changes include some cockpit canopy redesign to give improved aft vision, complete revision of the instrument façade (which now features dual flight-instrument panels), and an increase in the fuel capacity from 29.5 to 38.3 Imp. gal. The Type 91B, or Sk 50, is stressed for an ultimate load factor of 9, in order to provide the necessary safety latitude during combat manoeuvres, and the nosewheel landing gear has been strengthened. An extremely good overall finish has been obtained by De Schelde, and the parent company has expressed itself as being well pleased with the progress achieved by its sub-contractor.

In addition to the Safir programme, De Schelde will shortly begin work on the manufacture of complete outer wing sections for the six Saab-90 Scandia transports to be built in Holland under sub-contract, the fuselages by Fokker and the centre sections by Aviolanda. The De Schelde aircraft division's largest pre-war contract was for the construction of wing units for the Dornier Do.24K flying-boat which was built under licence in Holland by Aviolanda.

W.G.

The first of an order for seventy-five Sk 50 basic trainers in the main assembly hall at Dordrecht. Production rate is expected to reach six aircraft per month by December.



Bristol Fighter F.2A of No. 48 Squadron, R.F.C. Note that the upper longerons are horizontal forward of the observer's cockpit. Below, Brisfits of No. 22 Squadron at Vert Galand, April 1st, 1918.

THE BRISTOL FIGHTER

No. 2 of the Series

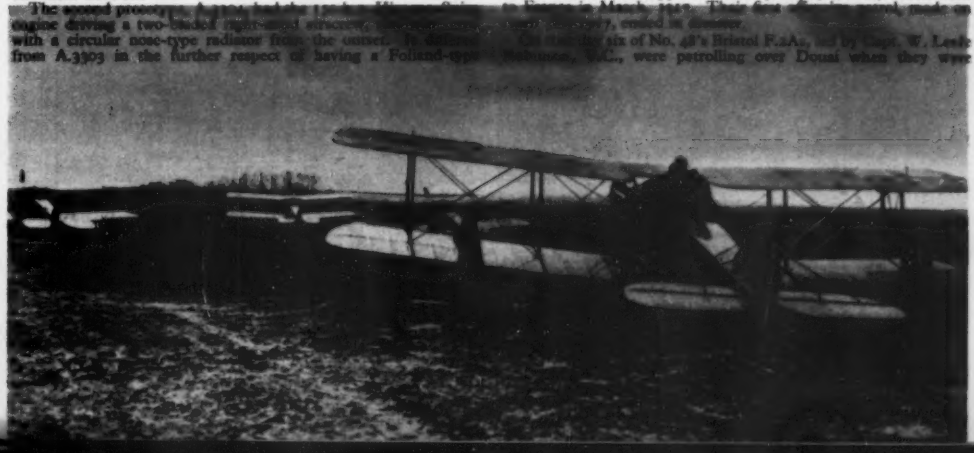
By J. M. BRUCE, M.A.

THIS, the second article in our special series placing on record the detailed history of British military aircraft of earlier years, deals with the famous Bristol Fighter. As in the previous article (devoted to the D.H.4 and published in "Flight" of October 17th last) the comprehensive nature of the information given bears witness to the prodigious amount of research and record-keeping undertaken by the author, over a long period of years.

NO other aeroplane ever justified its name more fully than did the Bristol Fighter; certainly none was ever more aptly or plainly named. When he designed it, Capt. Frank S. Barnwell made a major contribution to the attainment of Allied air supremacy at a critical period of the first war in the air, for the Bristol was one of the most deadly aerial weapons of the 1914-18 conflict.

In its earliest form, the machine was known as the Bristol F.2A and it first appeared in the autumn of 1916. Two prototypes were built. The first, A.3303, had the 190 h.p. Rolls-Royce Falcon I engine with a pair of vertical radiators, one on each side of the fuselage in line with the fireproof bulkhead. The entire engine cowling was very different in appearance from that which later became so familiar on the hundreds of Rolls-Royce-powered Bristol Fighters which were built. The engine drove a four-bladed left-hand airscrew, and short exhaust pipes of unusual design were fitted. However, it was soon found that the tall vertical side-radiators interfered with the pilot's forward view, and a round nose-type radiator was substituted. The four-bladed airscrew was retained for a time, but A.3303 was also flown with a two-bladed left-hand airscrew.

The second prototype, A.3304, had the Hispano-Suiza engine driving a two-bladed right-hand airscrew, [illegible] with a circular nose-type radiator from the outset. It differed from A.3303 in the further respect of having a Foland-type [illegible]



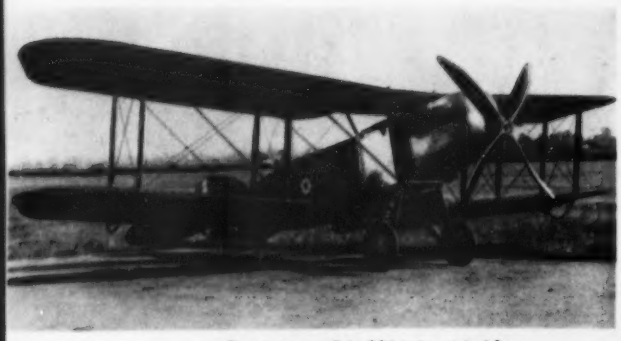
only of an open framework of two transverse tie-rods, cross-braced for rigidity. A feature of the two prototypes was the fitting of a vertical end-plate to the inboard end of each lower main-plane; these plates were later removed.

At the time of the F.2A's appearance, all available Hispano-Suiza engines were wanted for S.E.5s, so the production order called for the Falcon-powered version. Fifty were built, numbered A.3305 to A.3354, and were almost identical with the later form of A.3303, but, in the production machines, the plan-form of the wing-tips was modified to the simpler, blunt shape which remained standard on the Bristol F.2B, and the airscrew was a two-bladed right-hand one. The lower centre-section remained an open structure. The engine cowling on the earliest production F.2As differed slightly in detail from that of the later machines but all the F.2As could be distinguished from the later F.2B by the fact that the upper longerons were horizontal forward of the observer's cockpit, whereas on the F.2B they sloped downwards.

The F.2As were supplied to No. 48 Sqn., R.F.C., which went [illegible] in March, 1917. This [illegible] made an [illegible] 1917, ended in disaster.

[illegible] six of No. 48's Bristol F.2As, led by Capt. W. Leslie [illegible], were patrolling over Douai when they were

The Bristol Fighter . . .



First prototype of the F.2A in its original form.

Standard F.2B of 1917-1918. Two-bladed or four-bladed airscrews were fitted. The type number covered many different engine installations.

F.2B fitted with 230 h.p. Siddeley Puma. Note radiator under engine.

attacked by five Albatros D.IIIs flown by Manfred von Richthofen and four of his "gentlemen." Ignorant of the Bristol's capabilities as a fighting aeroplane, Leefe Robinson's men attempted to hold formation instead of making use of the machine's superb manœuvrability—a quality still undiscovered at that time. Only two of the six returned. A.3340, piloted by Lt. A. M. Leckler with Lt. H. D. K. George as his observer, fell to Richthofen as his thirty-fifth victim, and another Bristol, manned by Lts. H. T. Adams and D. J. Stewart, was forced by the Red Knight to land near Quincy for his thirty-sixth victory; but the aeroplane was burned by its crew. Leefe Robinson was shot down, and captured by Feldwebel Sebastian Festner.

In his combat report, Richthofen said that the Bristol appeared "to be quick and rather handy," but he continued: "The Albatros D.III was, both in speed and ability to climb, undoubtedly superior." His views seemed at first to be borne out by other early losses suffered by No. 48 Sqn., but in the hard school of war the Bristol pilots rapidly gained confidence in the strength and manœuvrability of their machines. Soon they discovered that the Bristol was most effective when fought as a single-seater, with the observer left to protect the tail: Leefe Robinson's men had made the mistake of treating the machine in the orthodox two-seater fashion, regarding it primarily as a platform for the observer's gun.

Once it was realized that the Bristol was a machine of tremendous structural strength, with all the tractability of a single-seat scout, its success was assured. Its qualities made it a redoubtable foe, even when outnumbered, and the enemy soon learned to treat it with great respect. In combat, the fact that the pilot and observer were so close together let them communicate with each other instantly and easily, and an amazing pitch of fighting efficiency was attained by Bristol crews. To them, their machine was known affectionately as the "Brisfit," or simply as the "Biff," and it was beloved of all who flew it. Its 15 years of squadron service with the R.F.C. and R.A.F. are ample testimony to its superb qualities.

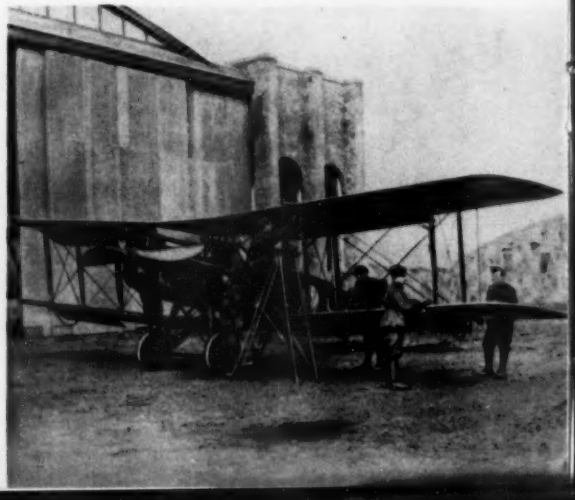
Service experience with the Bristol F.2A led pilots to ask for an improvement in the view forward from the cockpit, so the fuel tank and cowling were made narrower by sloping the upper longerons downwards in front of the observer's cockpit. The revised fuselage was first tested on A.3304, the second prototype F.2A. The production aircraft thus modified, numbered from A.7101 onwards, were designated Bristol F.2B, and the designation was applied to all subsequent variants. An additional refinement in the F.2B was the covering of the lower centre-section.

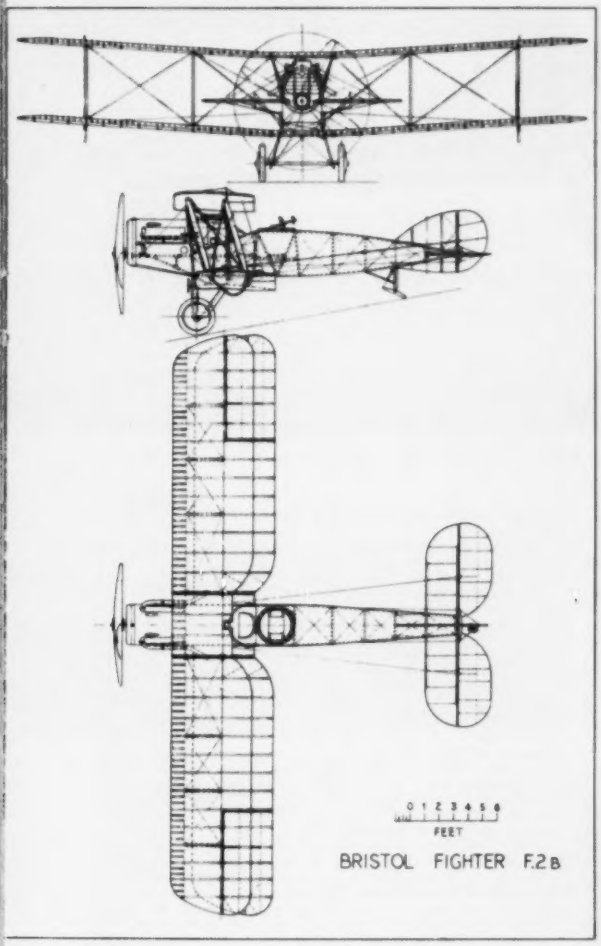
Like the production Bristol F.2As, the first 150 F.2Bs (A.7101 to A.7250) were powered by the 190 h.p. Rolls-Royce Falcon I, with the exception of A.7177, in which the prototype Falcon III installation was made. The next 50 F.2Bs (A.7251 to A.7300) had the 220 h.p. Rolls-Royce Falcon II, and all the rest, B.1101 onwards, were intended to have the 275 h.p. Falcon III.

Most Brisfits did, in fact, have the Falcon III engine, but in 1918 the supply of Rolls-Royce engines became short, and several alternative types were used, with varying degrees of success. Many of the later F.2Bs had the 200 h.p. Sunbeam Arab. Later still, Siddeley Pumas and Hispano-Suizas were also fitted. Various patterns of exhaust pipes were used, those on the Falcon-powered machines varying considerably in length and shape.

Below, American-built Bristol Fighter with Liberty engine.

Rigging an Australian Arab-powered F.2B at Leighterton in 1918.

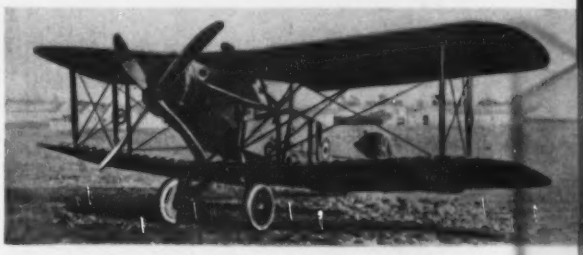


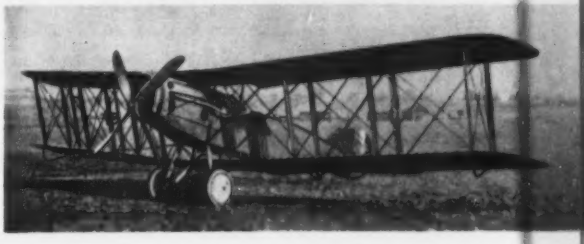


WEIGHTS AND PERFORMANCE

	190 h.p. R.R. Falcon I	275 h.p. R.R. Falcon III	200 h.p. Sunbeam Arab	200 h.p. Hispano-Suiza
Weight empty ...	1,700 lb	1,745 lb	1,733 lb	1,733 lb
Weight loaded ...	2,650 lb	2,590 lb	2,630 lb	2,630 lb
Max. speed at:—				
s.l.	110 m.p.h.	—	121 m.p.h.	—
10,000ft ...	—	113 m.p.h.	126 m.p.h.	125 m.p.h.
13,000ft	—	108 m.p.h.	—	100½ m.p.h.
15,000ft	—	—	97½ m.p.h.	97½ m.p.h.
Landing speed ...	—	43 m.p.h.	43 m.p.h.	43 m.p.h.
Climb to:—				
1,000ft	—	50 sec	—	1 min 10 sec
10,000ft	—	11 min 15 sec	15 min 5 sec	15 min 5 sec
15,000ft	—	—	28 min 50 sec	28 min 50 sec
Absolute ceiling ...	—	22,000ft	—	21,000ft
Normal endurance	—	3 hr	—	—

NOTE.—Available data for other engines indicates that with the 300 h.p. Hispano-Suiza the maximum sea-level speed was 128 m.p.h., and normal endurance 2 hr 40 min, while with the Siddeley Puma maximum sea-level speed was 120 m.p.h.





The two experimental Bristol Fighter F.2Bs shown in the Crown Copyright photographs above and below are very little known. They were built for comparative tests at the Royal Aircraft Establishment, Farnborough. The machine above had single-bay wings of 4.69 aspect ratio; the three-bay wings of the example below were of 9.73 aspect ratio.

The Sunbeam Arab had stubs or pipes. The installation of the Puma strongly resembled that of the D.H.9, but had, on the port side, a single exhaust pipe of massive proportions. It seems that only a few experimental Bristol Fighters (e.g. A.7260, B.1201, D.7860) had the 200 h.p. R.A.F.4D engine. The installation was anything but beautiful, but was no doubt the best that could be made.

In action the Brisfit was magnificent, and its crews never refused battle, no matter how heavy the odds against them. Its quality as a fighting aeroplane can be gauged from Major A. E. McKeever's victory score of 30, nearly all of which were won on Bristol Fighters. Such was the reputation of No. 11 Sqn. (of which McKeever was a member) that enemy pilots did not consider it discreet to attack if more than three of its Bristols were together, and eventually No. 11's pilots found that they could not get a fight at all unless they flew in pairs or singly. No. 11 Sqn. received its Bristol Fighters in May, 1917, to replace F.E.2Bs, and continued to fly the Bristol until the Armistice.

Other units flew the type with equal success. No. 48 Sqn. avenged its early misfortunes several times over, for by the time of the Armistice its Brisfits had destroyed 148 enemy aircraft. No. 22 Sqn. received Bristol Fighters as replacements for F.E.2Bs in July, 1917. On May 7th, 1918, two Bristols of this squadron attacked seven Fokkers over Arras and shot down four before the arrival of enemy reinforcements in the shape of 15 more scouts. The two Brisfits fought on until forced to break off the engagement through shortage of ammunition, by which time four more Fokkers had been shot down. A few days later five Brisfits met 30 enemy aircraft and destroyed nine of them against one pilot and one observer wounded. A similar action was fought by four of No. 139 Sqn.'s Bristols in Italy on the morning of August 8th, 1918, when they beat off the attack of 20 hostile scouts.

In Palestine, No. 111 Sqn. received S.E.5As and Nieuports in January, 1918, and handed over their Bristol Fighters to No. 67 Sqn. (No. 1 Sqn., Australian Flying Corps) to replace No. 67's R.E.8s. In the hands of No. 67 Sqn.'s pilots the Brisfits played a leading part during the advance of General Allenby's Army across the River Jordan in 1918, and, on September 21st, 1918, wrought ghastly havoc among the retreating Turks trapped in the Wadi el Far'a. At that time the irregular Arab forces under Feisal and Lawrence were hampered by the enemy's air activity, so Maj. W. G. H. Salmond sent his one and only Handley Page O/400, two Bristol Fighters and a D.H.9 to their assistance. The O/400 transported supplies and, by virtue of its size, made a tremendous impression on the Arabs, whilst the Brisfits soon

A "Flight" photograph of a Bristol Fighter Mk IV used by the Cambridge University Air Squadron. Note Handley Page slots and horn-balanced rudder.

The Bristol Fighter . . .

distinguished themselves by bringing down two enemy two-seaters and a Pfalz scout.

Had the war in France lasted a little longer it would have seen the Sunbeam Arab version of the Bristol Fighter widely employed on corps reconnaissance duties. This type was intended to be a replacement for the R.E.8, but the Armistice prevented the Arab Brisfit from showing its paces. On October 31st, 1918, the R.A.F. had 321 Arab-powered Bristol Fighters on charge, but only 79 of those were with the Expeditionary Force in France. The only units actually equipped with the Arab version were the Long Range Artillery Spotting Flights "L," "M," "N," "O" and "P," the two last-named flights being completely equipped with the Arab Brisfit.

In the less spectacular field of Home Defence, if the nine squadrons theoretically equipped with Bristol Fighters had been at full strength they would have been a force to reckon with. The total establishment of these units (Sqns. No. 33, 36, 38, 39, 51, 75, 76, 77 and 141) was 208 Bristols, but on June 8th, 1918, they could muster between them only 56 Brisfits and two Martinsydes. Despite their small numbers, however, the Home Defence Bristol Fighters scored successes. Just after midnight on the night of May 19th-20th, 1918, one of No. 141 Sqn.'s machines, flown by Lt. E. E. Turner, with A/Mec. H. B. Barwise as his observer, shot down a Gotha near Harrietsham. On the same night, Lt. A. J. Arkell and A/Mec. Stagg, in a Bristol Fighter of No. 39 Sqn., brought another Gotha down in flames over Roman Road, East Ham. These bombers were not the first of their type to fall to Bristol Fighters. On July 22nd, 1917, No. 48 Sqn. went up to intercept Gothas returning from a day-light attack on Harwich, and, diving from 16,000ft to 3,000ft to attack, Capt. R. Baker and his observer, Lt. G. R. Spencer, shot one down into the sea.

After the war, the Brisfit was used for army co-operation duties and bore the brunt of the perilous but unspectacular work on the North-West Frontier of India until replaced by the Westland Wapiti. In company with the faithful D.H.9A it also did a great deal of the thankless policing of Iraq.

In its army co-operation form (Mks II and III) the Brisfit became more and more overloaded, and it was as much as the old warrior could do to stagger off with message pick-up gear, camera, wireless, generator, tropical radiator, lengthened exhaust pipes and emergency rations. How it did so was a never-ending source of amazement to its pilots, but not a few crashes were caused by thus overburdening a willing horse.

Fortunately, at about this time the Brisfit was being used in the conduct of various aerodynamic experiments with wings of different aspect-ratios, aerofoil sections and, most important of all, Handley Page slots. The fitting of slots gave the Bristol a new lease of life and prolonged its Service career by a few years. After July, 1928, all R.A.F. Brisfits which came up for reconditioning were converted to Mark IVs by the fitting of slots, long-travel under-carriages and balanced rudders. They were then supplied to the University Air Squadrons and were finally regarded as obsolete in 1931, from which time onwards they were offered for sale to the public.

Service squadrons which used the Brisfit in the post-war years were No. 2 (February, 1920, to March, 1932), No. 4 (April, 1920, to October, 1929), and Nos. 5, 6, 16, 20, 24, 28 and 31.

Civilian and Foreign Service.—Consequent upon the signing of the Armistice and the great reduction in the requirements of the R.A.F., enormous numbers of Service aeroplanes became surplus, among them many Bristol Fighters. Not unnaturally, the Brisfit's fine war record commended it to other nations, and many Bristols went overseas at various times to serve in foreign air forces. Belgium, Russia, Spain, Holland and Norway were among the countries using them in the post-war years. Holland had Bristol Fighters in service in 1920, in company with Fokker D.VIIs and C.1s. Spain ordered Brisfits after the Riff rising in Spanish Morocco in 1921, and these machines were flown out to Spain by British free-lance pilots. All the Spanish machines had the 300 h.p. Hispano-Suiza engine and were given Spanish civil registrations for the flight, although they were not actually accepted until they reached Madrid, when Spanish military markings were painted on.

Final proof of the Bristol Fighter's ubiquity lies in the fact that one was on the strength of Sun Yat Sen's rebel air force in China.

It was, of course, inevitable that many Brisfits should find their way on to the British Civil Register, and during the immediate post-war years the Aircraft Disposal Co. turned out a steady trickle of reconditioned Bristol Fighters for civilian use. The first Brisfit to go on the civil register was H.1376, later registered G-EASH, which had a 300 h.p. Hispano-Suiza engine.

Many of the Bristol Fighters registered after G-EASH were shipped abroad, one batch being given British civil registrations in 1922 for a ferrying flight to the Belgian Air Force. Possibly the best-known civil Brisfit was G-EBIO, which was used by the Aircraft Disposal Co. as a demonstration machine. It was registered in November, 1923, and was ultimately sold to F/L. D. V. Ivins in 1931.

In their turn, the Mark IVs came on the civil register from 1931 onwards and the first of them, G-ABXA, was modified to act as a tanker for the flight-refuelling of Mrs. Victor Bruce's Saro Windhover during her unsuccessful attempt on the world's endurance record in 1932. Other noteworthy civil Brisfits were G-ABYF, used for towing advertisement banners, and G-ABYT, flown to second place in the 1933 Folkestone Trophy Race at 113.5 m.p.h. G-ABZG and G-ACFK were used by Commercial Airways (Essex), Ltd., at their flying school at Abridge. G-ADJR and G-AEPH were registered in 1935-6 by Mr. C. P. B. Ogilvie, and the former was later sold to London Film Productions, Ltd., who used it as a camera machine, whilst the latter is, happily, still in existence and flying today, proudly displaying its original serial number D.8096.

The Bristol Fighter saw commercial service throughout the world, from Sweden, where several were used on skis, to New Guinea, where Ray Parer used one, together with a D.H.4 and a D.H.9, to pioneer air transportation.

Apart from ex-Service machines sold by the Aircraft Disposal Co. for civil use, the Bristol Company converted many of those

still in course of construction at the time of the Armistice. These conversions were known as Bristol Tourers, and the first, a simple modification of the Falcon-powered Fighter, had in place of the gun-ring an enclosed cockpit for one passenger, with lifting coupé-top and a triangular panel let into each side of the fuselage. Later conversions had the rear fuselage widened to accommodate seats for two passengers. The engines used were either Wolseley Vipers or Siddeley Pumas, and a Puma-powered three-seat seaplane version was also produced for use in Canada.

The Bristol Jupiter-engined Fighter of 1923 was also basically the Bristol F.2B design, differing from the original in having a 425 h.p. Jupiter IV engine and oleo undercarriage, whilst the later trainer version had a larger fin and rudder, plywood-covered fuselage and Frise ailerons.

The Bristol F.2B in America.—Like the D.H.4, D.H.9, D.H.9A (U.S.D.9A), Handley Page O/400, S.E.5A and Martinsyde F.4, the Bristol F.2B was selected for large-scale war production in the U.S.A., but only a small number of the type and a few American developments were built. Production of the basic design was entrusted to the Curtiss concern and 2,000 were ordered. The 400 h.p. Liberty 12 engine was fitted (contrary to the advice of the Bristol Co., who recommended the Wright-Hispano only) and this version was probably unique as the only form of the Bristol Fighter to have a spinner. The whole aspect of the engine installation was distinctly "Hunnish" but rather bulky, and the pilot's forward view cannot have been particularly good. The machine proved to be nose-heavy, and

Puma-powered three-seater Tourer as shown at Olympia in 1919.

production was stopped after only 27 had been delivered. The first Curtiss-built Bristol was delivered in April, 1918.

American-built developments were as follows:—

Engineering Division USB-1 (300 h.p. Hispano-Suiza H).—This was to have been the other main production form of the American-built Bristol Fighter. One was built in August, 1918, and a contract for 2,000 production machines was cancelled at the Armistice.

Engineering Division USB-2 (290 h.p. Liberty 8).—One was built in September, 1918, and assigned to McCook Field, where it bore the station number P.137 on its rudder. It crashed before its flying tests could be carried out, and no performance figures were established.

Engineering Division XB-1A (300 h.p. Hispano-Suiza H).—Four XB-1As were built in July, 1919. The type was described as an improved version of the USB-1.

Dayton-Wright XB-1A (330 h.p. Wright H).—Forty were built in 1920 and 1921 and, apart from the engine, were generally similar to the Engineering Division XB-1A. The loaded weight was, however, some 800 lb greater. In 1921 one Dayton-Wright XB-1A was converted to have a 350 h.p. Packard 1A-1237 engine.

BRISTOL FIGHTER FACTS AND FIGURES

Alternative power plants.—190 h.p. Rolls-Royce Falcon I; 275 h.p. Rolls-Royce Falcon III; Sunbeam Arab; 200 h.p. Hispano-Suiza; 300 h.p. Hispano-Suiza; Siddeley Puma.

Dimensions (Falcon III version).—Span, 39ft 3in; length, 26ft 2in; height, 10ft 1in; wing area, 405.6 sq ft.

Manufacturers.—The British and Colonial Aeroplane Co., Ltd., Filton and Brislington, Bristol: 2,602 machines, serial numbers A.3303-A.3354, A.7101-A.7300, B.1101-B.1350, C.4801-C.4900, C.751-C.1051, C.4601-C.4800, D.7801-D.8100, E.2151-E.2650, F.4271-F.4970 (R.-R. Falcon or Sunbeam Arab).

Sub-Contractors.—*Sir W. G. Armstrong Whitworth and Co., Ltd.* Gosforth, Newcastle-on-Tyne: 250 machines, serial numbers E.1901-E.2150 (Sunbeam Arab). *The Gloucestershire Aircraft Co., Ltd.*, Cheltenham: 300 machines, serial numbers C.9836-C.9984, E.9507-E.9656 (Sunbeam Arab). *Harris and Sheldon, Ltd.*, Stafford Street, Birmingham: 100 machines, serial numbers F.5074-F.5173 (Sunbeam Arab probably fitted). *Marshall and Sons*, Gainsborough: 150 machines, serial numbers D.2626-D.2775 (Sunbeam Arab). *National Aircraft Factory No. 3*, Aintree, near Liverpool: 500 machines, serial numbers D.2126-D.2625 (200 h.p. Hispano-Suiza) (only 126 delivered). *Angus Sanderson and Co.*, Newcastle-on-Tyne: 250 machines, serial numbers E.2561-E.2900 (Sunbeam Arab probably fitted). *The Standard Motor Co., Ltd.*, Coventry: 250 machines, serial numbers E.5179-E.5428 (Sunbeam Arab). *The Austin Motor Co., Ltd.*, Birmingham: H.6058 (Siddeley Puma). Other later contracts were placed for Bristol Fighters, the machines having serial numbers in the H and J ranges. Some of these later machines (e.g. H.1690) had the Siddeley Puma engine.

Production and Allocation.—Over 3,800 Bristol Fighters were built during the 1914-18 war, and production continued into 1919. On October 31st, 1918, there were 1,583 Bristol Fighters on charge with the R.A.F. Of that total, 721 had Sunbeam Arab engines, and presumably most, if not all, of the other 862 had Rolls-Royce Falcons. On that date 249 Rolls-Royce Brisfits and 79 Arab machines were with the R.A.F. in France; 48 were in Italy; 42 were in Egypt and Palestine; 58 were with Home Defence Squadrons; and 62 were with Flying Schools. The remainder were in store, at Aeroplane Repair Depots, or scattered up and down the United Kingdom at various aerodromes.

Mark Numbers.—Mk I: Standard production model of 1917-18, irrespective of engine fitted. Mk II: Standard Middle East Army Co-operation model of 1921-22, with tropical radiator, large (desert) wheels and greater all-up weight. N.B.: All R.A.F. Bristol Fighters in post-war service up to 1924 were modified to Mk II standard. Mk III: A complete redesign of the aircraft (in 1924) bearing the Bristol type number 96. In this were assimilated all Mk II modifications as integral design characteristics and thus empty weight was saved. An oleo tail-skid was fitted and the aircraft was available with dual controls. Mk IV: Bristol Type 96a. This was a Mk III with Handley Page slots, stronger undercarriage, cambered fin, horn-balanced rudder and increased all-up weight. N.B.: Most Mk IIIs were modified up to Mk IV standard prior to issue to the University Air Squadrons.

Armament.—One 0.303in fixed Vickers gun mounted centrally under the cowling, and synchronized by Constantinesco gear to fire forward through the revolving airscrew; either one or twin double-yoked 0.303in Lewis machine-guns on Scarff ring-mounting on rear cockpit. Carriers for light fragmentation bombs could be fitted beneath the lower mainplanes. Twelve 20 lb Cooper bombs could be carried.

Service Use.—*Western Front:* Squadrons No. 11, 20, 22, 48, 62 and 88. No. 4 Sqn. had one Bristol Fighter. Used by the Long-Range Artillery Spotting Flights "L," "M," "N," "O" and "P" as follows: Flight "L," Rolls-Royce and Sunbeam Arab versions; Flight "M," Rolls-Royce version; Flight "N," Rolls-Royce and Sunbeam Arab versions; Flight "O," Sunbeam Arab version; Flight "P," Sunbeam Arab version. *Home Defence*: Nos. 33, 36, 39, 76 and 141 Sqns. *Palestine:* No. 67 (No 1 Sqn., Australian Flying Corps) and 111 Sqns. *Italy:* No. 139 Sqn. The Bristol Fighter also formed the equipment of "Z" Flight of No 34 Sqn.

Operational Trainer Version: Used at Air Observers' Schools at Hythe, New Romney, Manston and Eastchurch; School of Photography, Maps and Reconnaissance at Farnborough; No. 35 Training Sqn., Northolt.

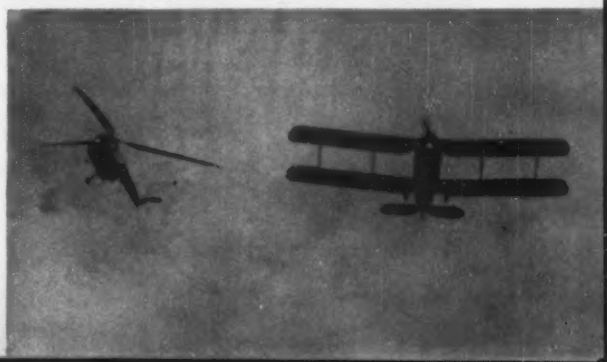
Notes on Individual Machines.—A.3340, F.2A of No. 48 Sqn., shot down by Manfred von Richthofen on April 5th, 1917, for his thirty-fifth victory; A.7131, aircraft "5" of No. 11 Sqn.; A.7177, prototype installation of Rolls-Royce Falcon III engine; A.7183, also later fitted with Falcon III (engine No. 27, W.D.22376); A.7260, later fitted with 200 h.p. R.A.F.4D engine; B.1200, 200 h.p. Hispano-Suiza; B.1201, tested in January, 1918, with 200 h.p. Hispano-Suiza (engine No. 16456, W.D.11334) and later fitted with 200 h.p. R.A.F.4D, and flown with both standard two-bay wings and experimental three-bay wings of 9.73 aspect-ratio.

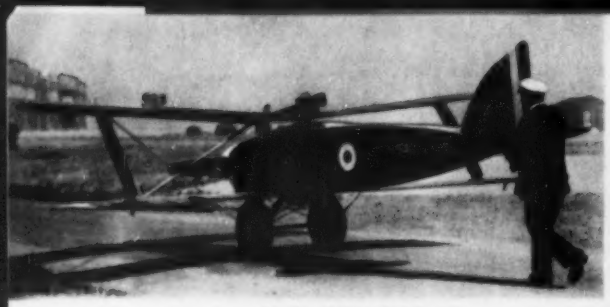
D.7860, fitted with 200 h.p. R.A.F.4D and experimental single-bay wings of aspect-ratio 4.69; D.8096, at one time allotted civil registration G-AEPH, and still in existence; F.4360, had the standard Falcon III installation, but was fitted with the experimental single-bay wings of 4.69 aspect-ratio; F.4728, also had the standard Falcon III engine, but was fitted with the experimental three-bay wings of aspect-ratio 9.73; H.1460, converted to coupé version in 1919; H.1642, converted to dual-control trainer for Cranwell, 1925; H.1688, dual-control modification for communications duties, 1919; H.1690, 240 h.p. Siddeley Puma engine; H.6058, 240 h.p. Siddeley Puma engine (built by Austin Motor Co.); J.6689, converted to dual-control trainer for Cranwell.

Some Bristol Fighters of No. 67 Sqn (No 1 Sqn., Australian Flying Corps).—A.7200; B.1148, N.S.W. No. 2, *The White Edenglassie;* B.1229, N.S.W. No. 11, *The Macintyre Kayuga Estate* (flown by Capt. Ross Smith, later Sir Ross Smith, K.B.E., M.C. and Bar, D.F.C. and two Bars, A.F.C.); C.4623, Australia No. 20, N.S.W. No. 18, *The McCaughey Battleplane;* C.4624, N.S.W. No. 12, presented by the Government of New South Wales; C.4626, N.S.W. No. 15; C.4627, *City of Adelaide*, presented by Mrs. Harry Bickford.

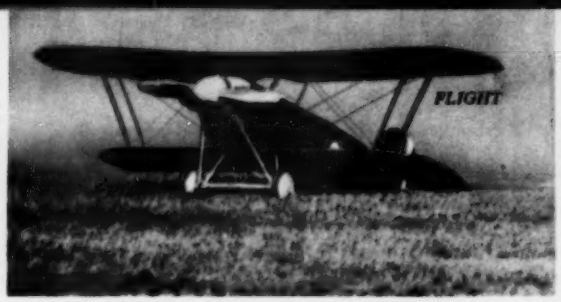
"Flight" photograph

The only remaining Brisfit—D8096—in formation with a Sycamore.





Eastchurch Kitten (A.B.C. Gnat).

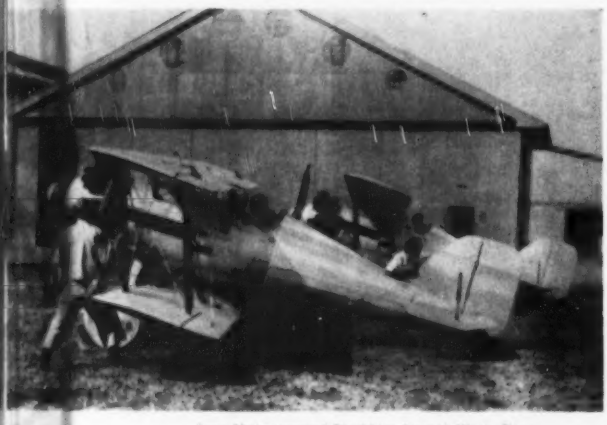


Grain Kitten (A.B.C. Gnat).

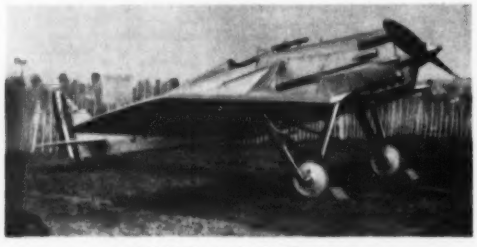
LIGHT

A Note on their Possibilities and

Vickers Virao (Armstrong Siddeley Lynx).

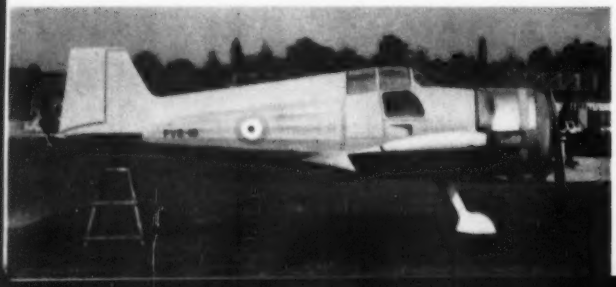


Lynx Major-powered Blackburn Lincock IIIs in China.



D.H.77 (Napier Halford Rapier).

Vickers Venom (Bristol Aquila).



THE interest occasioned by the recent disclosure that Folland Aircraft are well advanced with the design of a very light "utility" fighter, described as supersonic, and capable of being built quickly and cheaply, prompts some thoughts on fighters of this class.

The light fighter concept is by no means new. For 35 years at least the designers of several countries have sought, for one reason or another, to save size, weight and complication, and consequently, to reduce cost and man-hours.

In the continued absence of Government contracts, prototypes of the new Folland fighter—designed by Mr. W. E. W. Petter—are being built as a private venture, and the company is convinced that armament, equipment and flying qualities will prove fully adequate for most of the functions of the larger, heavier single-seaters. In speed and climb, it is thought, these more costly types should be equalled or even surpassed.

The new fighter is described by its makers as "a radical approach to the problem of weight-saving"; they add their belief that conventional attempts to reduce weight can produce no very great overall saving in the future—that the best results will come from a completely fresh start. Implicit in their plans is the need for a very different operational technique from that used by present-day fighters, the weight of which is already cut to the possible limits, having regard to such considerations as equipment and armament, and take-off and landing requirements.

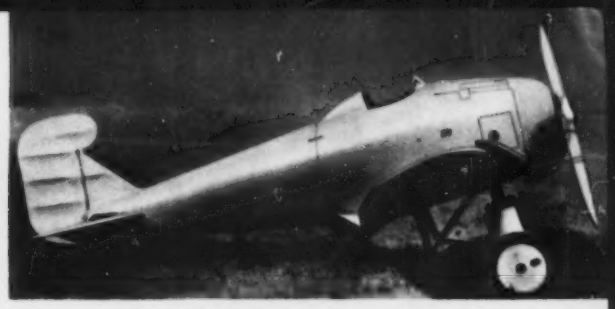
It is pointed out that the increased complexity of the modern fighter has brought with it very considerable rises in cost and man-hours. The money which would buy 1,100 fighters in 1930 will now purchase fewer than 100, while the man-hours needed to build a Hawker Hunter are over three times those put into a last-war Hurricane. These considerations, of course, apply with special force to Great Britain, where, as the Chancellor of the Exchequer recently observed, "the planes, tanks and guns we are now making for our own defence must have their cost matched by a corresponding saving of taxes."

The problem of finding more skilled labour is of such gravity and urgency as to require no further emphasis.

As usual, one of our uninhibited American contemporaries supplies such information as is available on light-fighter development in Great Britain. There is a reference in *Aviation Week* to British alarm at the trend towards heavier and more complex and expensive aircraft, and proposals which have been submitted for a "stripped-down jet fighter grossing only 5,000 lb." Rolls-Royce are said to have proposed a 3,000 lb thrust turbojet, weighing only 550 lb. Another report refers to short-life turbojets made from

Caudron Cyclone (Renault inverted-vee).

B.A.T. Bantam (A.B.C. Wasp).



H.P.21 (Bentley rotary).

FIGHTERS

Evolution: The New Folland Prototypes

cheaper and less durable materials than usual and operated at higher temperatures over a life of only 10 to 20 hours. Rolls-Royce, Bristol and Armstrong Siddeley, it is asserted, are all working on turbojets of this description.

The bold lead now taken by Folland Aircraft recalls some notable approaches to the light fighter problem in past years. While Blackburn's famous Lincock is perhaps the best known of the British attempts, it will be seen that this was by no means the sole example.

The Sopwith Pup showed what could be done by keeping structure weight and wing loading low, and equipment and armament light; but the Pup did not represent a conscious effort to depart from contemporary practice. The designers of the day were, of course, even more weight-conscious than those of the present, because of the low engine powers at their disposal.

It was the R.N.A.S. Kittens, designed by the Grain and Eastchurch establishments, which were the classic examples of deliberate diminution of size and weight during World War I. Designed to operate from destroyers and other small craft as fighting scouts, these prototypes were probably the lightest military aircraft ever constructed. Each was powered with the 30-35 h.p. A.B.C. Gnat engine. The Grain design (PV7) had a wing span of 18ft, weighed 520 lb all-up, carried a Lewis gun and fuel for 3 hr. The maximum speed was 88 m.p.h. The Eastchurch effort (PV8) had, as will be seen, single interplane struts similar to those of the Sopwith Triplane and was, in consequence, sometimes erroneously called the Sopwith Kitten. It weighed about 650 lb all-up, spanned 19ft, and would cruise at over 80 m.p.h.

Ultra-light enthusiasts of the present will eye covetously these little biplanes of 35 years ago.

The next British design meriting comment was Frederick Koolhoven's B.A.T. Bantam, which, with its 170 h.p. A.B.C. Wasp radial engine, demonstrated a quite astonishing performance in the period 1918-19. The gross weight was about 1,340 lb, and the span 25ft. Top speed fell little short of 140 m.p.h. and the climb to 10,000ft took slightly over 7 min.

Counterparts of the Grain and Eastchurch Kittens in that they were naval fighting scouts, the Handley-Page H.P.21 and the later Vickers Vireo and Avro Avocet were designed with a particularly sharp eye to size and weight. The H.P.21 had a Bentley rotary of 230 h.p., but the Vireo and Avocet were designed to take the supercharged Armstrong Siddeley Lynx, which, in its normally aspirated version, was the unit then standard for R.A.F. trainers.

Blackburn's Lincock biplane of 1928 is the finest British example of a light fighter, having been designed from the outset to have a performance very nearly equal to that of contemporary machines using twice its power. Moreover, it had unsurpassed manoeuvrability and was far more economical than its heavier contemporaries both as regards initial outlay and running and maintenance costs. Again the engine was a Lynx. The prototype Lincock I was a wooden machine with a Lynx IVC and became famous for its aerobatic demonstrations and as a racer in America. Four metal Lincock IIIs with Lynx Major engines were built; two of them went to Japan and two to China.

Though small in size, the Lincock had provision for full service equipment, including two Vickers guns and wireless. Notwithstanding the very small size of the machine (span 22ft 6in), the cockpit was roomy and comfortable. With a geared Lynx the metal Lincock achieved 150 m.p.h., landed at 60 m.p.h. and had an initial climb of 1,250 ft/min.

A later and, of course, heavier project, with Rolls-Royce Kestrel engine, was to be known as the Blackcock, but before this flew the engine was changed to a Jaguar, and the aircraft—being intended for Turkey—was called the Turcock.

Though built to meet the same Air Ministry specification as the Kestrel-engined Hawker Fury and Fairey Firefly biplanes of 1929, the D.H. 77 intercepter monoplane made use of the very compact and relatively low-powered (337 h.p.) Napier-Halford Rapier, with which it achieved a speed of over 200 m.p.h. Similarly, to the specification which produced the Hurricane and Spitfire, Vickers built their Aquila-engined Venom—a notably compact design of much lower all-up weight than the Merlin-engined machines.

The finest examples of true "light" fighters to appear in the 1930s, however, were French, and two of these, together with an Italian type, are illustrated. Typical of the French machines was the Caudron Cyclone, with its inverted-vee air-cooled Renault of 450 h.p. This design reflected Coupe Deutsch racing experience and had a 20 mm gun in each wing. The top speed was about 290 m.p.h.—about 40 m.p.h. below that of the contemporary Hurricane.

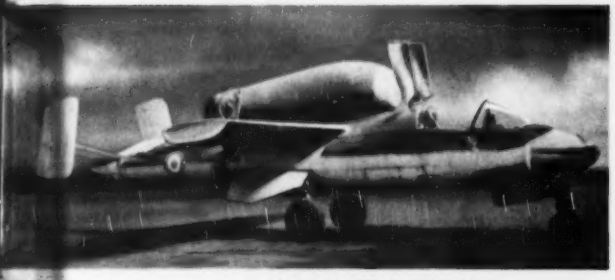
Most notable of the war-time designs was the American Bell XP-77, built when American manufacturers were threatened with a shortage of strategic materials, and accordingly of all-wooden construction. Powered with a

Mureaux 190 (Salmson inverted-vee).

Italian Romeo Ro41 (Piaggio P.7).

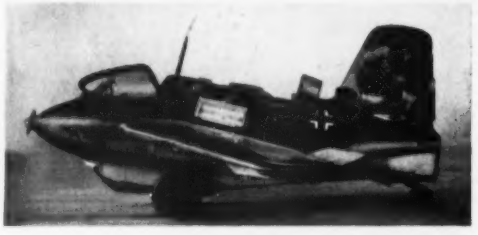
Bell XP-77 (Ranger inverted-vee).

North American Mustang XP-51F (Merlin).



Heinkel He 162 (BMW 003).

Me 163B (Walter HWK 509 rocket).

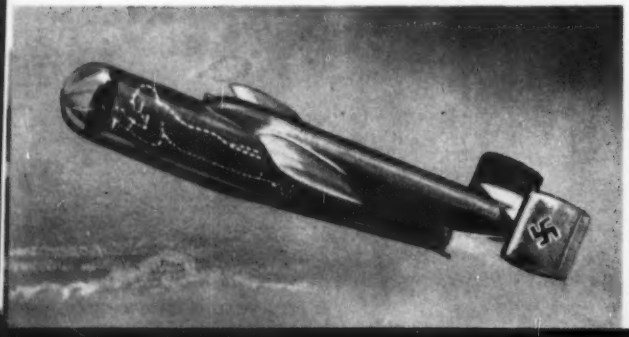


Light Fighters . . .

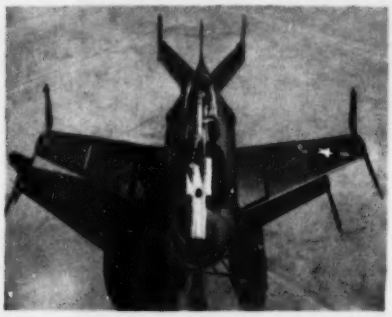
575 h.p. Ranger inverted-vee engine, it was armed with a 20 mm cannon mounted above the crankcase and firing through the airscrew hub, and two 0.5in. guns, one on each side of the cannon. With a span of 27ft 6in., the wing area was only 100 sq ft. Top speed was about 400 m.p.h.

As is well known, repeated efforts were made to lighten the weight of Allied fighters during the late war, especially in face

Arado project for an air-launched fighter with prone pilot.



McDonnell XF-85 (Westinghouse J-34).



of the Japanese Zero menace. Equipment, armour and armament loads were all lessened in different degrees and combinations at various times, but one of the most radical departures was the building of the so-called "Lightweight Mustang." Designated XP-51F, this prototype had no parts interchangeable with other Mustangs. The wing was of new, laminar-flow design, and weight was saved wherever possible, resulting in a total reduction of 1,600 lb. The armament was four guns and less fuel was carried.

A highly specialized lightweight fighter was the post-war jet-propelled McDonnell XF-85, developed as a "parasite" for the defence of the B-36 bomber, from which it was air-launched. The span was a mere 21ft 1½in.

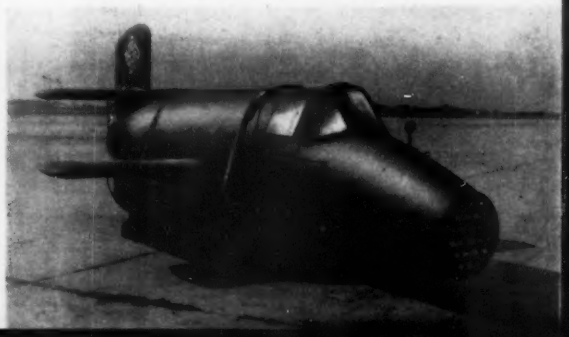
It was in Germany, during the late war years, however, that light-fighter development was to be seen to the best advantage. A number of machines powered with turbojets and rockets were built and flown. The rocket-powered types actually flown or projected can be classified as (1) non-expendable machines, exemplified by the Me 163, 263 and P.1104, the Heinkel Julia and Junkers Walli; (2) the semi-expendable variety, typified by the ramp-launched Bachem Natter; and (3) special-purpose designs such as the miniature air-launched Arado and a Zeppelin ramming project. Of these only the Me 163B became operational. Weighing about 9,500 lb and having a wing area of 186 sq ft, this achieved about 550 m.p.h. and climbed to 30,000ft in slightly more than 2¼ min.

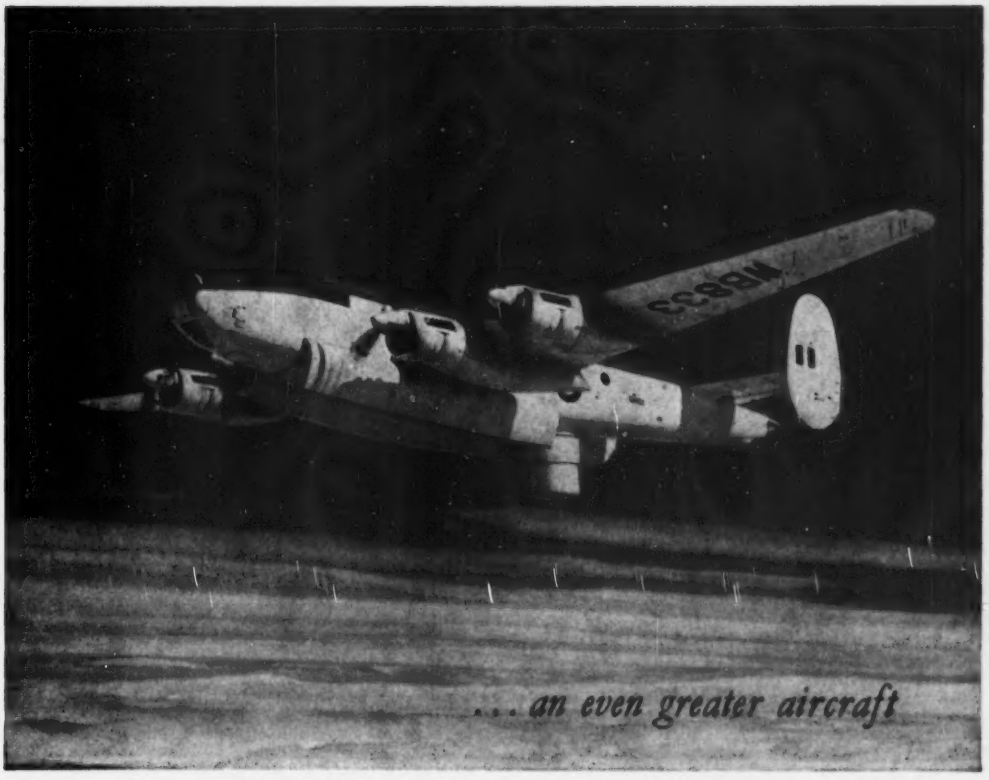
Perhaps the nearest approach to the new Petter design was the He 162 Volksjager, which had a wooden fuselage and a metal wing, and was designed to be built very quickly and with a minimum of strategic materials. In keeping with the essential simplicity of the design, the BMW 003 turbojet was mounted on top of the fuselage. The span was 23ft 8in. and the flying weight about 5,500 lb. Standard armament was two 30 mm MK 108 guns, each with 50 rounds. The maximum speed of about 520 m.p.h. was comparable with that of the Vampire.

The prone pilot's position appears especially attractive on a light fighter, though there is no indication that any currently projected fighters—light or otherwise—embody this feature. An example is the Arado project illustrated.

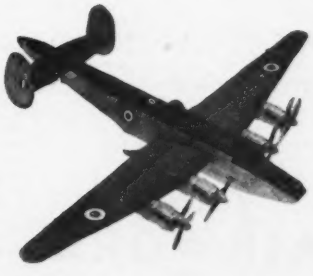
The emergence of the new Petter is now awaited, and interest in the design will not be lessened by the knowledge that of all the light fighters we have mentioned on these pages only a single type—the Me 163—saw service! H.F.K

Bachem B.P.20 Natter (HWK 509 rocket).





AVRO SHACKLETON MARK 2



The Avro Shackleton Mark 1 was designed especially to meet the requirements of Coastal Command. It has proved to be a great aircraft for its allotted task of long range ocean patrolling. Now the Shackleton Mark 2 . . an even greater aircraft . . is soon to join Mark 1 in the squadrons of Coastal Command. Incorporating all the performance characteristics that have made the Mark 1's so outstandingly successful, the Mark 2 has these additional operational improvements : hard-hitting nose armament, consisting of two 20 mm. cannon ; retractable radar " dustbin " ; retractable tail wheel and faired tail fuselage housing an observer's station. The enormous capacity of the bomb-bay is unaltered and the Mark 3 Airborne Lifeboat is carried on air-sea rescue missions.

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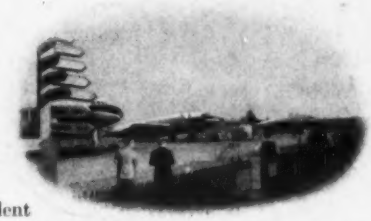

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BLOWING HOT and COLD

R.Ae.S. Lecture on Control of Pressurization and De-icing Air

Dr. E. W. Still, of Teddington Controls, Ltd., a summarized version of whose R.Ae.S. paper is printed below. Until 1950 he was chief project engineer for Rolls-Royce, Ltd.

THE technology of controlling the air systems found in modern aircraft has now become so complex as almost to defy appraisal in a single lecture. This feat has, however, been successfully achieved by one who has done much to develop such control systems for a great many modern British aircraft—Dr. E. W. Still, Ph.D., B.Sc., A.C.G.I., A.M.I.Mech.E., F.R.Ae.S., who is research and development manager of Teddington Controls, Ltd. His paper—a summary of which follows—was read as a Royal Aeronautical Society "section" lecture on October 30th.

The purpose of his paper, said Dr. Still, was to illustrate some of the problems encountered in the temperature-control of aircraft pressure-cabins and de-icing services; it would be noted that the normal control of engine jet-pipe temperature was not to be covered, although the methods of control discussed could in many cases be used for this purpose.

The advent of the jet engine had meant that, owing to the large quantities of hot air available, many aircraft services were now operated from an air supply tapped from the engine. Initially, there was considerable opposition from engine designers to this practice, but the case for it was so strong that in England it had become accepted as standard procedure.

The air-temperature rise through a compressor with a pressure ratio of 6 : 1 and over was quite high, but it should be remembered that the air had to have sufficient pressure at high altitude to supply the needs of the crew when flying at minimum cruise r.p.m. It was thus not practicable to use lower compressor-ratio tappings at high altitudes; had this been possible it would have meant considerable simplification of the temperature-control systems which, at the moment, had to operate at extremes of both air pressure and temperature. The lowest cabin pressures currently recommended were the equivalent of 8,000ft altitude for civil aircraft, and 25,000ft for fighters and bombers. Although this implied the maintenance of high engine r.p.m. so as to keep the required delivery pressure, the minimum r.p.m. increased with altitude, so providing the desired pressure. One also had to consider the thrust reduction resulting from the bleeding of compressor air; whilst the amount of air required for military aircraft cabins was not large, careful thought should be given to the quantities required for de-icing.

To overcome the latter problem, some designers had turned to electrical heating of engine intakes and wing surfaces. Here, the available electrical energy usually limited the installation to small units; in any case, it was more applicable to civil aircraft where there might be large electrical reserves available from the pantry. Another solution was the use of ram air, suitably heated by a heat exchanger off an exhaust-gas tapping, which was particularly advantageous where axial engines were installed. Theoretically, one could tap gas from between turbine stages, but this involved considerable design problems owing to the temperatures encountered.

In examining the conditions of control, the first point to notice was that the use of the engine compressor had obviated the need for an auxiliary heater; it was now a case of cooling the compressor air over quite wide ranges of temperature. This required development of a cold-air unit which, in its latest form, was a turbine driving a fan, so extracting heat energy from the airflow and reducing its temperature; the fan was often used to provide an airflow off the primary cooler and hence to give some ground cooling. At high altitude, all the heat was required to keep the cabin warm, and hence the primary cooler could be by-passed.

Full temperature control could be obtained only by a gradual change from "full heat" to "full cold," which meant that both the primary cooler and the cold-air unit should be capable of being by-passed. In practice, many complications arose. On a tropical take-off, the cabin might require such cooling as to tend to reduce the duct temperature below freezing point, resulting in the frosting up of the ducts and the freezing of the humidifier. If the maximum reduction of temperature had already been achieved, more cooling could be obtained only by increasing the cabin airflow. The alternative was to extend the time necessary to achieve the required cabin temperature.

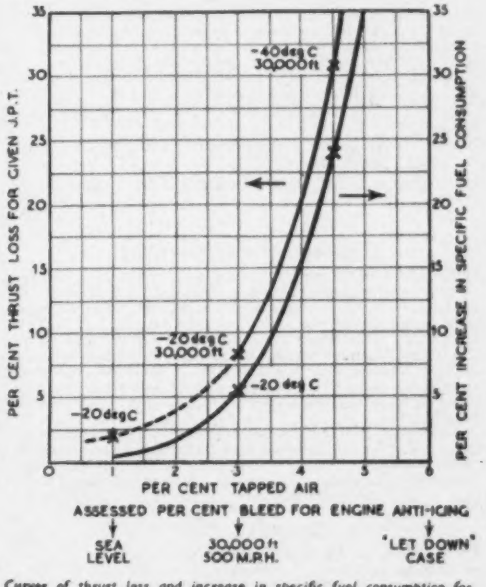
The lecturer then examined typical components of modern air systems, discussing primary coolers, the cold-air unit, control valves, and methods of control. Dealing with the latter, he considered electrical circuits, mechanical inching controls, electro-pneumatic and hydraulic inching controls, and the employment of sensitive relays, valve amplifiers, and magnetic amplifiers. An extensive discourse then followed on feed-back systems, and control stability.

Dr. Still's paper then turned to icing indicators—although, as he said, it could be argued that what really was required was an "ice anticipator" since, once ice was formed, it might take twice as much heat to remove it as would originally have been required to prevent the initial deposit. But neither an indicator nor an anticipator could deal with the problem of a very cold aircraft letting down through a cloud at ambient temperatures above freezing; much thought was still required on this subject.

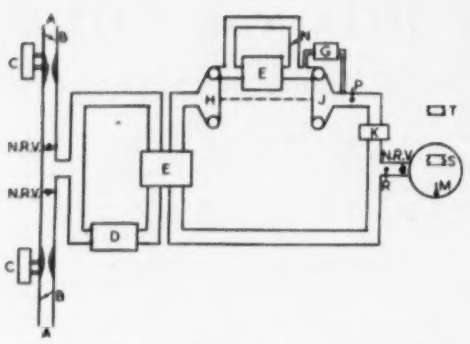
Cabin air systems of civil aircraft posed individual problems in that duplicated control systems were usually employed, both circuits having to be kept precisely in phase. Other subjects discussed in some detail were the provision of windscreen heating and de-icing and various methods of airframe de-icing.

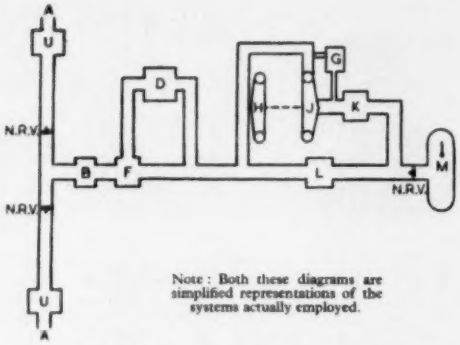
Speaking of the near future, Dr. Still said that because the economic use of the jet engine improved with altitude, one could visualize civil aircraft flying at 60,000ft at Mach numbers between one and two. Engine compression ratios would be about 10 : 1. Mach 1 gave a ram-compression temperature rise of 50 deg C; whilst M = 2 provided 200 deg C; this implied that, if the outside air temperature were −56 deg C, then the corresponding engine inlet temperatures would be about −6 deg C and +146 deg C respectively.

At 60,000ft the absolute pressure was about 1 lb/sq in, whilst the cabin pressure required was over 10 lb/sq in; this meant that the full engine compressor-ratio would be required to pressurize a civil aircraft at altitude. These high compression-ratios also resulted in temperature rises of 350 deg C, so that the air leaving the compressor for the cabin would be—at the speeds mentioned—around 350 deg C, or 600 deg C, respectively. The problem was thus one of temperature reduction. Implied in this was the enormous pressure the system would have to withstand at sea level, and the first step to control such a system would seem to be



Curves of thrust loss and increase in specific fuel consumption for given percentages of compressor bleed air.





Note: Both these diagrams are simplified representations of the systems actually employed.

Block diagrams of two typical cabin air temperature-control circuits. The key is as follows:—

A—Air from engine compressors.
B—Flow control valve.
C—Flow controller.
D—Primary cooler.
E—Secondary cooler.
F—Temperature control valve.
G—Pressure ratio controller.
H—C.A.U. brake compressor.
J—C.A.U. turbine.
K—Water separator.
L—Flow augmentor.
M—Temperature control.
N—Under-heat valve.
P—Under-heat control.
R—Over heat.
S—Cabin flood flow switch.
T—Ambient flood flow switch.
U—Isolation valve.
N.R.V.—Non-return valve.

BLOWING HOT AND COLD . . .

the supply of air from the engine at compression ratios proportional to altitude, so giving maximum compression at the aircraft ceiling. This would reduce the maximum pressures to which the system was exposed, but it would not reduce the maximum altitude temperatures, hence any heat-exchangers used had to be capable of operating with through temperatures of from 400 to 600 deg C, and cooling air from 0 to 200 deg C.

For the case of M=2 a new approach was required as the present coolers and cold-air units were incapable of giving the necessary temperature reduction—or, possibly, of being strong enough to withstand the high temperatures involved.

Vortex tubes had not been mentioned in his paper, but Dr. Still considered it probable that, with the higher engine compression ratios now contemplated, this method might shortly become a rival to the normal cold-air unit. German reports indicated that the equivalent cooling efficiencies of cold-air units were obtained if 100 lb/sq in air pressure were available. In some respects the future might offer some simplification, since at high speeds there was no anti-icing problem at all.

Finally, the lecturer made the following recommendations and conclusions:—

(1) Air tapped from the main engine compressor formed the natural source of heat supply.

(2) Engine designers should incorporate in their compressors a sufficient margin of air bleed to cover all aircraft demands, as indicated by the following table:

MAXIMUM AIR BLEED REQUIREMENTS (lb/min per engine)

	Single Engined Aircraft	Twin Engined Aircraft	4 or more Engined Aircraft	Remarks
Cabin flow	10	20	50 to 100	Constant
Accessories	10	10	10	Constant
Windscreen	3 to 6	10	10	In icing only
Engine anti-ice ...	50 to 100	50 to 100	50 to 100	In icing only
Wing anti-ice ...	150 max	250 max	250 max	In icing only
Total	275	390	470	

(3) Since they were normally a small proportion of the total bleed required from the engine, cabin airflow requirements should be generous. The temperature changes for given heat loads did not then need to be extreme, and they would simplify the over-ride controls of either temperature or flood flow and delete increased refrigeration airflow.

(4) Coolers and cold-air units and valves should be made to operate at engine pressures up to 200 lb/sq in and temperatures of 400 deg C.

(5) It was unlikely that engine manufacturers would encourage the idea of variable pressure-tapping of compressors; nor was it desirable, since (a) all available pressure was required at high altitude for cabin pressurizing, and (b) all available pressure might be required at low altitude for the cold-air unit brake turbine.

(6) Automatic cabin temperature control was an essential part of military jet aircraft.

(7) It was probable that hot air anti-icing of engines would be the method employed in the future (in preference to electrical-pad heaters) as the control of the hot air was easier over the wide range of required conditions of flight.

(8) The automatic control of de-icing was no different from cabin temperature control except for the necessity of anticipation.

ACCENT ON FLYING-BOATS

THE advent of the gas turbine has, in America at least, resulted in a very considerable revival in interest in the flying-boat. At the time of writing, two large marine aircraft are going into large-scale production for the U.S. Navy: the Convair R3Y and the Martin 275. The former is a long-range transport based on the XP5Y patrol bomber which first flew two years ago, and it is similarly powered with four Allison T-40 double turboprops of 5,500 h.p. each. The Martin—named Seamaster, and believed to carry the designation XP6M—is a very fast turbojet aircraft.

Yet another U.S. Navy flying-boat entering production is the Convair F2Y Skate, one of the fastest and most advanced marine aircraft yet built. All these types feature high length/beam ratios, characteristic of modern flying-boats. This feature demands, in turn, careful planing-bottom design to ensure stability.

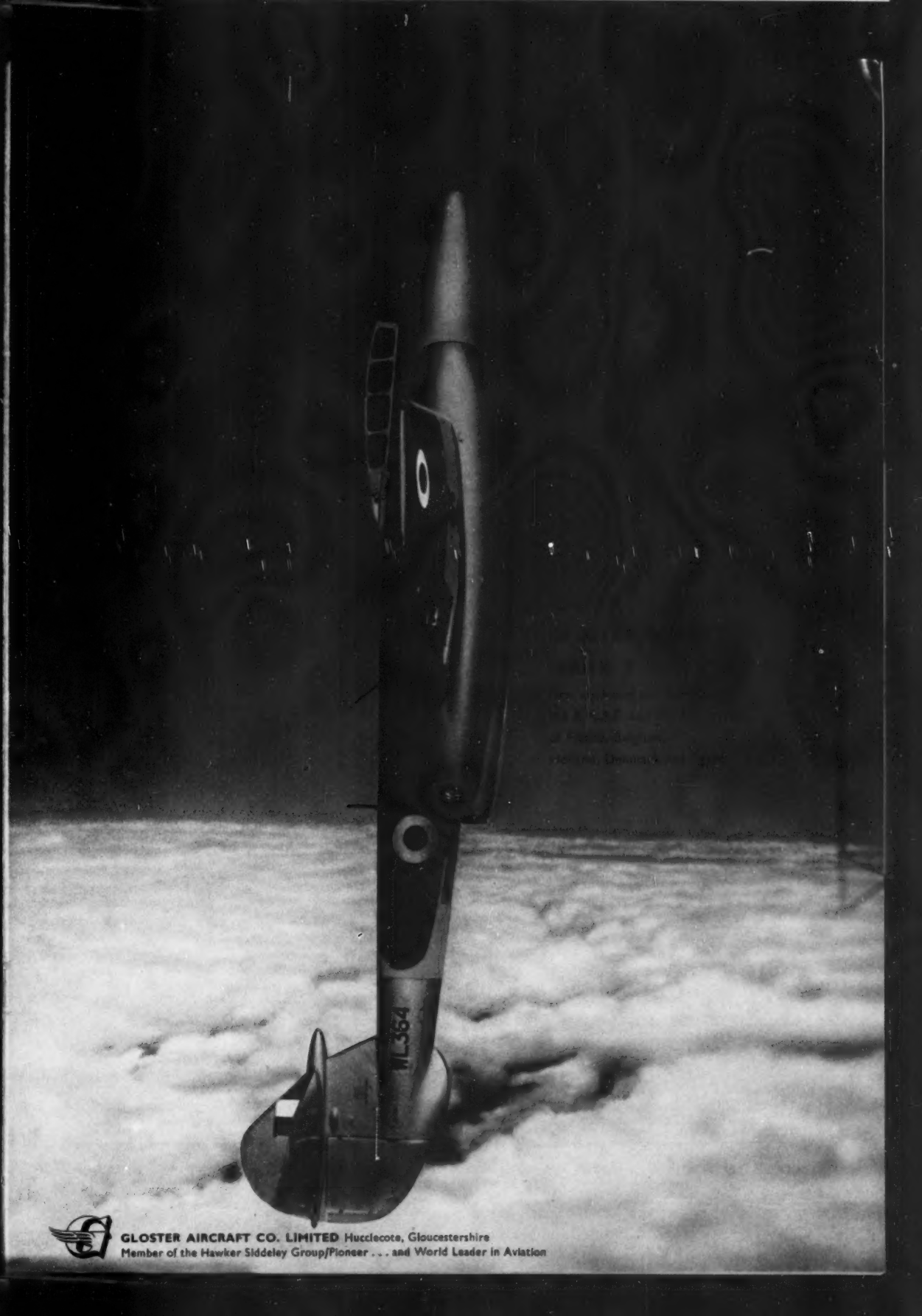
A GRACEFUL TRIBUTE

SPEAKING at the annual Motor Show luncheon held by Chloride Batteries, Ltd., Mr. H. V. Schofield, M.C., M.I.E.E., (sales director) paid this tribute to Britain's technical Press: "In a large measure we have to thank our trade and technical Press for the increase in production and industrial efficiency that has kept us on our feet. By studying world trends, reviewing the latest developments in machinery, materials and manufacturing techniques and by bringing their findings to the notice of those able to benefit from them, these journals have performed and still are performing a magnificent service to the community."

AMPHIBIOUS-HELICOPTER TESTS

IN recent issues of *Flight* we have published photographs of trials with the first Westland-Sikorsky amphibious helicopter, and on the occasion of the first reference credit was given to Lt.-Cdr. Roy Bradley for the trials, while, in a longer contributed article which followed, Mr. John Fay gave his impressions as the pilot on amphibious trials.

To avoid confusion, it should be explained that the initial trials for A.R.B. clearance were made by Lt.-Cdr. Bradley, while the official tests in the presence of A.R.B. officials were carried out by Mr. Fay! Thus the series of water tests was a joint effort and, incidentally, both pilots reported very favourably on the handling of the helicopter on this element. The first actual engine-off auto-rotation landing on the water was made by Mr. Fay before the A.R.B. officials.



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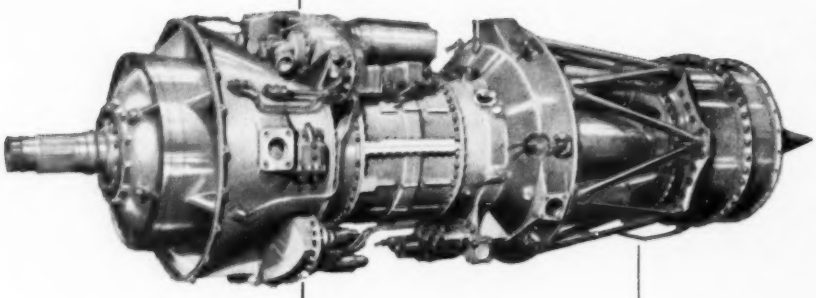

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CIVIL AVIATION

ARCTIC EXPERIMENT

IN preparation for the opening of regular passenger services between America and Scandinavia *via* the Northern route, two experimental flights are to be made this month by Scandinavian Airlines System. The first, scheduled for November 19th, will be made by a newly completed DC-6B named *Bjarke Viking* and flown by a Dane, Capt. Paul Jensen. Swedish and Norwegian aircrews will make up two complete crews, which thus represent the three nations whose combined resources are behind S.A.S. The passenger list on this proving flight will be limited to some 20 government and airline officials and arctic experts, and the aircraft will carry elaborate navigational and safety equipment, including rubber dinghies capable of use as tents. Fur coats, it is reported, will be issued to both crew and passengers. The aircraft will fly from Alberta to Copenhagen *via* the new American base at Thule, Greenland. A second flight over the same route will be made on November 25th.

A PROFIT IN NEW ZEALAND

A NET profit of £149,835 during the year ended March 31st, 1952, is announced by New Zealand National Airways Corporation. During the previous year the Corporation suffered a loss of £57,155, and this has been deducted, leaving a credit of £92,680. With commendable frankness, the airline states that the attaining of a profit-earning position can be attributed not only to the policy of standardizing on 24-seat DC-3s, but to "certain fortuitous circumstances": for the first four months of the year a waterfront strike created an abnormal demand on services, and delay in the conversion of additional Dakotas resulted in abnormally high passenger load factors during the year. At the end of the period under review, the Corporation's fleet consisted of 14 DC-3s (of which two were freighters), 5 Dominies, 1 Rapide and 3 Fox Moths. The entire fleet of 11 Lodestars was sold to American buyers during the year and four additional Dakotas were acquired for conversion. The report notes that there is still no evidence of a suitable replacement for the DC-3. The Corporation has made detailed investigations in the United Kingdom, Canada, Australia and America and finds that none of the projected replacements will be available before 1956, and that the cost per aircraft will not be less than £125,000. Meanwhile, the airline "is awaiting with interest" the arrival for trial in New Zealand of the D.H. Heron, which promises to be suitable for feeder services.

On the internal services, N.Z.N.A.C. flew just over 5m revenue miles during 1951/52 and carried some 303,000 passengers on scheduled flights, increases of, respectively, 4.4 per cent and 27.1 per cent. The overall revenue load factor was 77.22 per cent, compared with 71.75 per cent for the previous year, and the revenue passenger load factor was 86.14, compared with 79.6 per cent. Mileage flown on the Pacific regional services on behalf of the N.Z. Government was 332,000 and the number of revenue passengers carried was 4,405—results almost identical with those for 1950/51.

CHARTER NOTES

AIR-CHARTER activities of the major British independent airlines continued to increase—following the recent slack period—during the seven days ended November 1st. Silver City Airways reported that their Bristol 170s flew twice the weekly mileage they have averaged over the past few months, and the activities of the York-operators showed no appreciable slackening. The number of aircraft available for charter has been increased by Eagle Aviation's acquisition of the four Vikings previously used for trooping—but not owned—by Crewsair.

Altogether last week the independents completed 120 charter flights, 108 of them on the Berlin minor airlift; the distance flown was about 97,500 miles, made up of 22,000 miles of passenger-flying and 75,500 miles with freight. During the 29 passenger flights completed, an estimated 1,480 persons were carried and on 91 freight trips some 535 tons of cargo were uplifted; all but 27 passengers and 50 tons of freight were transported in Germany. Freight ton-miles completed amounted to 135,000 and passenger-miles to about 407,000 (37,000 more ton-miles). Yorks maintained their position as the most-flown aircraft and covered 42,000 miles; Bristol 170s flew 29,000 miles and Dakotas 26,500. These operations involved about 600 flying hours and netted £50,000, the highest earnings since these notes were first published.

The longest flight of the week was by Eagle Aviation, who completed the last stages of the cattle-ferrying between Karachi and Brazil and finally returning to London: this one charter involved 32,000 miles of flying in two weeks. Skyways of London, extremely busy on trooping work, flew freight in a York from Bangkok to Amsterdam. Another long flight was completed by a B.K.S. Aerocharter Dakota which took 27 passengers from London to Elizabethville; this company also flew a Dakota-load of freight to Athens. Fairey Aviation sent a Dakota to Nairobi with 2,500 lb of film equipment for Metro-Goldwyn-Mayer.

The Berlin airlift almost doubled in intensity. Air Charter, Ltd., made 60 flights with its Yorks, 32 to Hamburg with 256 tons of freight and 28 to Hanover with more than 1,450 refugees. Similarly, Silver City's Berlin flights have been increased to a basic 48 each week, carrying 240 tons of freight to Hanover and Hamburg.

ELIZABETHANS TO STOCKHOLM

ALTHOUGH appropriately named for B.E.A.'s Scandinavian services, the Viking—after more than five year's service on the London-Stockholm route—has inevitably been replaced by the more modern and capacious Elizabethan. The inaugural flight of the new type on this route was made by G-AMAD, *Sir Francis Drake*, on Sunday, October 26th, the crew consisting of Capts. J. R. Turner and J. Clements, R/Off. D. T. Healy, Steward R. Paynter and Stewardess V. Davis.

The take-off took place exactly on time (writes a *Flight* staff-member who flew on the trip), and a small amount of vibration that could be felt on the climb disappeared on levelling out at 15,000ft (effective cabin altitude, 5,000ft). The spaciously original and pleasing lines of the Elizabethan interior have been remarked on many times; but they still make a satisfying first impression. Some 30 min after take-off, Capt. Turner's first bulletin gave our position as Great Yarmouth, air speed 220 m.p.h., and ground speed 260 m.p.h. A visit to the cockpit emphasized the good qualities of the aircraft from the pilots' point of view. Although cruising power had been reduced, we landed at Copenhagen 15 min ahead of schedule, having taken 54 min off the previously scheduled Viking time. It was by this time dark and, leaving Copenhagen on time, little could be seen through the aircraft windows until the steward dimmed the cabin lights over Stockholm, more effectively to view the lights of that city. A smooth landing was made, 5 hr 20 min after leaving London (flying time 4 hr 20 min) and 15 min ahead of schedule. We were greeted by Mr. Antony Caro, B.E.A.'s area manager, Sweden, who was confidently looking forward to an increase in passenger traffic to and from Stockholm on the new service.

The following morning the aircraft was due to leave for England, with an unusual cargo item in the shape of a huge bouquet of flowers destined for the Royal Command Film Performance in London that evening. After the flowers had been formally and photogenically handed over to the stewardess, the passengers embarked, the station engineer gave the "thumbs up" signal—and the starboard engine refused to start. All was well after a ten-minute delay, however, and Mr. Caro's worried look disappeared as the aircraft taxied out.

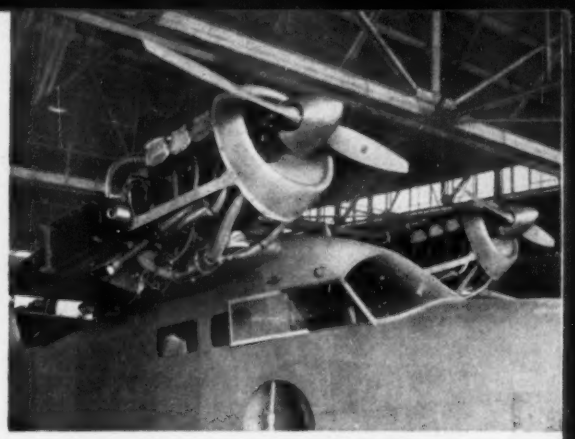
Two days later, we made the return trip in G-ALZT, R.M.A. *Sir John Hawkins*, which had flown the second Elizabethan service to Sweden. The crew consisted of Capts. I. R. Harvey and K. Burrows, R/O. A. G. Halligey, Steward R. Parker and Stewardess M. Hughes. Extremely high winds were forecast, and experienced, on the Copenhagen-London sector; 40 min out of Copenhagen a 65 m.p.h. headwind reduced our ground speed to 185 m.p.h. Flying past a text-book selection of clouds, including several tall cu-nim growths, we eventually crossed the English coast at Great Yarmouth, touching down at L.A.P. 15 min behind schedule.

As on the outward trip, the journey had been extremely comfortable: to the Elizabethan aircraft's innate excellence were added on both occasions the services of a first-class crew—a most effective combination and, it is to be hoped, a lucrative one, on this most competitive route.

RUNWAY VISUAL RANGE

AS from Monday, November 10th, the use of cloud-base as a limited factor in expressing weather minima will be replaced by critical height—the minimum height above airfield level to which an approach to landing can be safely continued without visual reference to the ground. The Air Navigation Order of 1949 is being amended to implement the recommendations made as a result of a Viking crash at London Airport in October, 1950 in bad weather; the Amendments are also in line with conclusions reached at the last I.A.T.A. Technical Conference. The new provisions are based on the concept of reporting runway visibility in terms of runway visual range, which is defined as the "distance along the runway which a pilot approaching to land or taking-off would be able to see the runway lights or runway markers."

The delay in introducing the new weather-minima rules is explained by the need to make certain that the system gives a reliable indication of what the pilot would see. Some 3,000 observations were made during the trial period with a modified



RE-ENGINED: 260 h.p. Lycoming power-plants have been installed in this Grumman Widgeon amphibian, replacing the standard Ranger units of 200 h.p. and permitting all-up weight to be increased to 5,000 lb (an increase of 500 lb). Cruising speed is increased by almost 20 m.p.h.—a typical figure being 164 m.p.h. at 6,000ft on 62½ per cent power, compared with 146 m.p.h.—and sea-level take-off run is reduced from 895ft to 640ft. This Widgeon, one of an estimated 250 in civil operation, is owned by the Superior Oil Company, who commissioned Lockheed Aircraft Service to carry out the work of modification; L.A.S. are now producing "conversion-kits" for other Widgeon-operators.

CIVIL AVIATION . . .

system before it was established as being sufficiently correct. At certain U.K. airfields, runway visual range will be measured by the ground authorities and communicated to the pilot, and if the range so measured is less than the company's minimum, the pilot will be forbidden to take off or make an approach to land. Operators of U.K.-registered aircraft will continue to be responsible for laying down weather minima for their own aircraft and for notifying such minima to the M.C.A.

THE ROME MISHAP: M.C.A. STATEMENT

SUCH is the renown of the de Havilland Comet, and the world-wide interest in its outstanding and unique achievements, that the Rome mishap has been publicized to an extent out of all proportion to the incident—one which fortunately involved no injury to passengers or crew. What caused the accident on take-off will presumably emerge at the official inquiry. The conflicting reports which at first appeared were followed, last Monday, by a preliminary statement by the Ministry of Civil Aviation. According to this, an investigation by the Chief Inspector of Accidents showed that the mishap was not caused by any failure or malfunctioning of the aircraft or its engines. Subsequently a joint statement by the de Havilland Company and B.O.A.C., following a meeting held in London on Monday, was made to the effect that in view of the M.C.A. official statement there was no need for the manufacturer and operator, who were in complete agreement, to issue any further comment. The particular aircraft involved G-ALYZ, was, incidentally, the last of the nine Series Is to be delivered (on September 30th).

An earlier statement, which gave the failure of an engine as the cause of the accident, appears in turn to have given rise to a newspaper comment that jet-engined aircraft are particularly vulnerable at the time of take-off. Such a suggestion is likely to be misleading, for, whether it has jet or piston engine power, every commercial aircraft must meet international civil aviation performance-requirements in order to be approved for operation over international routes and from the airfields concerned. It need hardly be said that the Comet has been subjected to all the usual trials, including take-off with simulated engine failure, both for its original certification and subsequently during routine training flights.

What also appears to have been overlooked by some is that there is much less tendency for the Comet to swing following engine failure on take-off than would be the case with a comparable piston-engined transport, because of the proximity of the power units to the fuselage and the absence of a feathered—or, worse, windmilling—airscrew.

Reference has been made in several places to the additional safety conferred upon the Comet by the use of kerosine fuel. Most recently, during the civil aviation debate in the House of Commons, Mr. Shackleton said that the Rome accident had shown the great superiority from a safety point of view of an aircraft which was not using highly inflammable fuel. He understood that all the main tanks burst when the aircraft crashed.

BREVITIES

NEW M.C.A. marshalling signals for tarmac controllers are illustrated in M.C.A. Information Circular No. 102/52.

* * *

The International Air Brokers Association held their first annual general meeting in Rome from October 6th-8th. Mr. J. Beeson, of the United Kingdom, is I.A.B.A.'s president.

* * *

Of the 50 Convair 340s ordered by United Air Lines, 27 are due for delivery by the end of this year, by which time U.A.L. expect to be operating these new 44-seat airliners daily along the entire Pacific coast. The company will be the first to introduce Convair 340s into scheduled service—on its California and Nevada routes on November 16th.

* * *

Finance is to be provided by the Australian Government for the purchase of twelve Viscounts—six for T.A.A., as officially announced some months ago, and six for A.N.A.

* * *

General Harold R. Harris, vice-president of the Atlantic division of Pan-American World Airways, will leave the company shortly to become president of Northwest Airlines. He will be succeeded by Mr. Harold E. Gay, who has headed Pan-American's Pacific-Alaska division since 1949.

* * *

Sabena have inaugurated scheduled freight services with DC-4 Skymasters to the Belgian Congo and to South Africa. Next year the Belgian airline intends to operate 23-hr Brussels-Johannesburg services with 70-passenger DC-6Bs.

The General Electric Company reports that its new HE38704 oven, now in production, can heat 60 meals simultaneously from a frozen state to serving temperature. Weighing only 88 lb, the oven was built to K.L.M. specification; orders have also been placed by T.C.A. and Pakistan International Airlines.

* * *

Air transport movements at U.K. airports during September totalled 21,878. By comparison with the figures for September 1951, the number of movements increased by 4.3 per cent and the number of passengers (363,350) by 6 per cent; the amount of freight handled decreased by 9.8 per cent.

* * *

The Douglas Aircraft Company announces that it now employs 60,000 people, and that sales of the DC-6-type airliner have now reached a total of 362. In addition, 58 examples of the compound-engined DC-7 have been ordered by four different airlines. Engineering of the 60/95-seat, 360-m.p.h. DC-7 is now complete, and the first delivery will be made next year.

* * *

Cheaper winter fares on the London-Amsterdam route are the result of a recent agreement between B.E.A and K.L.M. The off-peak rate of £11 return (£4 14s less than the standard figure) is a continuation of the summer off-peak fare. Tickets are good for 23 days, or, if the passenger chooses to fly by certain fixed peak-period services, for 48 hours. The Dutch airline provides all the off-peak services on the route for customers of both companies. This arrangement is effective until the end of April.

CIVIL AVIATION DEBATED AGAIN

"That the House, in reviewing the progress of civil aviation, should take note of the reports and accounts of the British Overseas Airways Corporation and the British European Airways Corporation for the year ended March 31st, 1952." (Moved by Mr. A. T. Lennox-Boyd, Minister of Transport and Civil Aviation.)

"But regrets that the efficiency and development of civil aviation and the morale and living standards of its workers are being gravely threatened by the present policy of Her Majesty's Government." (Opposition amendment moved by Mr. I. Mikardo and negatived by 348 to 315, the Government motion being carried without a division.)

POLITICAL acrimony was present during almost the entire length of this debate, which occupied members of the House of Commons for over six hours on October 28th. With a few notable exceptions, many of the arguments advanced were the familiar points covered on earlier occasions. The government speakers paid warm tribute to the work of the two State Corporations and some members of the Opposition, apparently hard-pressed to find genuine cause for constructive criticism in the present civil aviation policy, were content merely to praise the Corporations even more enthusiastically.

Now that the Government's new civil aviation policy is beginning to take effect (with rather more successes than many critics expected when it was announced last May), the speeches of Mr. Lennox-Boyd and his supporters reflect considerably more confidence than was apparent in earlier debates. Despite his partial pre-occupation with problems of road haulage—the object of one of the more relevant opposition criticisms, the Minister himself has obviously made the most of a relatively brief period in office to acquaint himself with the intricacies of civil aviation. By contrast, the Opposition attack was poorly co-ordinated and extremely political, rather than practical, in character. It was indeed surprising that the Minister's intimation that no major reshuffling of B.E.A.'s internal services is to be expected, at least in the near future, evoked not one "I told-you-so" speech from the Opposition benches.

MR. LENNOX-BOYD began by stressing the need for the development of speedy communications between the United Kingdom and the Commonwealth. He noted discussions which had taken place during the recess with Mr. Anthony, Minister for Civil Aviation in Australia, regarding the development of a Commonwealth round-the-world service in which the air lines of Britain, Australia and New Zealand would each play a part. Another matter discussed had been the provision of smaller aircraft for the Commonwealth routes, and the obvious interest of Colonial authorities in such aircraft as the Princes, Herons and Doves. He then turned to the privately-operated Safari service to East Africa—a service which, he claimed, enabled a large number of people who could not otherwise afford the cost involved to re-visit their home country.

The Minister then discussed the annual reports of the two Corporations. He first paid tribute to the way in which B.O.A.C., "by almost Herculean leaps" had contrived to transform a deficit of nearly £8m a year up to 1949-50 into a substantial profit. That was a development for which all connected with the Corporation deserved to be congratulated. While the Corporation had made it plain that they ascribed their success to the steady equipment of their services with modern aircraft, much had been achieved, under the leadership of the chairman, Sir Miles Thomas, in the way of concentration of maintenance bases, internal re-organization, increase of manpower output, sales drive, and insistence on commercial considerations. All this had made the Corporation "a thoroughly business-like operation."

Dealing with B.E.A., Mr. Lennox-Boyd said the outlook was not quite so favourable, but that this Corporation had had to contend with many difficulties unique to themselves, notably the heavy fuel tax, and the restrictions on European travel. Here again, great efforts had been made by the personnel involved, and Lord Douglas and his team were to be congratulated for their efforts, which had led to a 20 per cent increase in passenger-miles and freight ton-miles. Valuable work had also been done on helicopters, which might well be the complete answer to the problem of transport between cities if only the "frightful" noise factor could be overcome.

Mr. Lennox-Boyd then referred to the "constant irritation" of the 5s passenger tax, and expressed the hope that it would be possible, by international agreement, to absorb this levy into the fare, as was already the practice in America.

This brought the Minister to the main part of his speech—a fresh enunciation of Government policy. Their proposals, he said, were largely a development of the late Government's policy, for which Lord Pakenham, as Minister for Civil Aviation, was largely responsible; it was legalized by the Act of 1946, but was never given a fair trial because of various political predilections.

Mr. Lennox-Boyd admitted that one of the great problems facing the private operators was the provision of aircraft. He noted the great service which private companies rendered both in peace and war and commented that the Government would not rest until some solution of this very great problem had been found. Another difficulty, he said, was the anxiety among operators that the narrow gap in the three tiers of first-class, tourist, and colonial coach services would be so narrowed that it would not be worthwhile to run the last-named services. But despite this problem the new policy was already having a most spectacular result, and 104 applications had come in to A.T.A.C. to run services ranging all over the world.

Speaking on the subject of the internal services, Mr. Lennox-Boyd said that today, at a time when the Government were deeply concerned to save every penny they could, these services could not be amputated in any one sector without repercussions extending to other areas which otherwise would have lent themselves to supporting organizations. Some parts of the internal services paid their way; others did not. But although there did remain an overall loss—which could have been avoided if a different form of structure had been introduced—the measure of that loss was being substantially reduced. These facts had to be borne in mind in dealing with Scotland and other parts of the U.K. They made it difficult to find routes or groups of routes attractive to the individual company and which at the same time would avoid an increase of cost to the taxpayer on what was left of the B.E.A. services. These were all factors to which any responsible Government must pay regard.

The topical subject of Gatwick was then discussed. Aircraft movements in the London area, said the Minister, had increased by 50 per cent in the last four years, and scheduled movements by 100 per cent. The expectation was that movements would double again by 1960 and passengers more than double in the same period. No Government could ignore these facts; nor could they indefinitely maintain London Airport and Northolt as separate civil aviation centres in London. They were only a matter of seconds apart, and the problem of air traffic control in such conditions was rapidly becoming intolerable. Something had got to be done, and the Government had decided that Northolt must cease in time to be a civil airport.

It was also the Government's intention to reduce the number of airports around London from seven to two or three, *i.e.*, London Airport and Gatwick (collectively or separately) and another aerodrome whose establishment would be decided by the pattern of future development. Gatwick had been selected out of 50 possible sites.

Mr. Lennox-Boyd urged residents in the Gatwick area of Surrey to accept that the construction of this aerodrome was very much in the national interest. The Government were, however, deeply anxious as far as possible to carry local opinion with them in any action which might be taken. Accordingly, the procedure adopted would be that laid down in Circular 100 issued by the Ministry of Town and Country Planning. This procedure did not require a public inquiry to be held, but the Minister of Housing and Local Government had accordingly indicated that a public inquiry would be held if there was a demand for it.

The Opposition Attack

MR. FRANK BESWICK (Lab., Uxbridge) dealt with the reference to associated companies in the B.O.A.C. report. He was glad to see that there had been an improvement of nearly £200,000 in the year's working of British West Indian Airways. When was it expected that the other £94,000 deficit would be wiped out? Some explanation was also needed about the £101,000 loss of Bahamas Airways.

Referring to the B.E.A. Report, Mr. Beswick agreed the main difficulty was lack of modern aircraft. He estimated that 95 per cent of the revenue during the year was earned with twin-engined, unpressurized aircraft no longer abreast of competitors. Granted, however, that the position would improve when bigger and more economic aircraft came into service, that was not the complete reason, he felt, for the deterioration over the past year when a break-even load factor of 73.2 per cent was recorded for the year 1951-52. That was clearly too high. It was to be hoped, also, that next year the productive figure per employee would show an improvement.

Mr. Beswick agreed that the figure of profit or loss was still the most effective yardstick of achievement by the Corporation; but he thought this unit of measurement ought to be an accurate one. In Scotland, for example, the value of the services should be estimated by the Scottish office and paid for by them.

Dealing with aircraft supply, he urged the Minister to press for additional priority for civil aircraft. The delivery rate of the Elizabethans, the last of which would not be ready for B.E.A. service until 1954, ought to be quickened, and there was a case for adjusting military delivery dates and letting the Corporation have the Viscounts a little earlier than the date now promised.

There was also the question of production. Mr. Beswick wondered if the nation could afford a situation where more motor cars would be made available for the home market. He thought the design and engineering staffs of some motor car firms would be better employed in the aircraft manufacturing industry.

Mr. Beswick then drew attention to two topics which he produced as evidence that the Minister was spending his time working out ways and means of "hobbling" the two corporations. The first was the East Africa service, where B.O.A.C. ran a service through to South Africa in parallel partnership with South African Airways. Into this sphere of operation there had started a private operator at a cut-rate fare. Mr. Beswick understood that the company concerned had asked the Minister if it was not possible for them now, having established themselves on the route, to put up their fares. If this request was granted, the next step must be for the Corporation to increase their fares. He asked the Minister if he had in fact made any representation at all to the Corporation, in accordance with the wishes of others, to put up their fares.

Mr. Beswick's second point dealt with the Minister's announcement in a previous debate that in order to give the private operators an opportunity to establish themselves in the all-freight market the chairman of the two corporations had voluntarily undertaken not to apply for any all-freight services on any new routes for one year. He thought it strange that a spontaneous offer of this kind should have come from the chairman on the eve of that debate to help the Minister out of his difficulties. In any case, no one dreamed that the North Atlantic would be considered as a new all-freight route within the meaning of that undertaking. But now there was a private company given the right, it was said, to carry freight across the North Atlantic to the detriment of the Corporations. The Opposition could not understand why the Corporations did

CIVIL AVIATION DEBATED AGAIN . . .

not apply for permission to operate this all-freight Atlantic route.

Mr. Beswick then drew attention to the Minister's statement that it was essential that we should get the finest standard-bearer of the British flag to fly across the North Atlantic. Some of these services by private operators were now going to be operated by York aircraft at an all-up weight of 70,000lb compared with 66,500lb as operated by B.O.A.C. He questioned whether such aircraft would be suitable.

W/C. P. H. Lucas (Con., Brentford and Chiswick) suggested that the problem of aircrew supply might well become a limiting factor in our activities in ten years' time unless serious action was taken. It was not, he felt, the answer to say that we should get all the pilots we wanted from the Royal Air Force, from the National Service men who had learnt to fly, and from those who were released after short-term engagements.

His reasons for saying so were, firstly, because the very best types, particularly those with A.T.C. scholarships, might well be persuaded to stay on in the Service on a permanent basis; and, secondly, because he believed the needs of training in the military and civil fields, although parallel considerations, ought not to be permitted to overlap.

W/C. Lucas believed a system must be set up, not only to encourage recruits to civil aviation, but to provide them with a stable career to follow from the time they left school. He suggested that aeronautical courses could be included in school curricula, as was the case in America. Further, the Ministry of Civil Aviation should make courses available for boys on leaving school through establishments such as Air Service Training, Hamble, or, if necessary, by forming schools of their own with the help of the private flying clubs. It might be that a scholarship scheme, on the same lines as that organized by the Air Ministry for selected A.T.C. cadets, could be worked out jointly by the Ministry of Civil Aviation and the Ministry of Education.

Opposition support for W/C. Lucas's speech came from Mr. Edward Shackleton (Lab., Preston South), who then turned to the question of the East Africa services; what had happened, he claimed, had given cause for serious alarm among some people in B.O.A.C. He referred also to the performance of the Hermes aircraft, and to a growing amount of anxiety with regard to certain accidents that it had suffered. He wondered if some reassurance could be given concerning the difficulty that had been experienced with the propeller couplings. Mr. Maudling intervened to say that a number of technical modifications to cope with these problems had been introduced and were to be finally completed by October 31st.

Col. Alan Gomme-Duncan (Con., Perth and E. Perth), discussing Scottish traffic, said that it was essential for aircraft to be designed to suit the airstrips or airfields that might be available; the "Stratocruiser" attitude of mind, when dealing with small areas in Scotland, was all wrong. What was wanted was a service to link those areas to the great air services, so that there was a network over the entire country.

Independents Criticized

Mr. G. S. Lindgren (Lab., Wellingborough) said he understood that when serious decisions were made in regard to the future of the industry today, decisions which were likely to affect the livelihood of the men within the industry, consultation did not take place with the trade unions in the same effective and ready manner as it did during the period of the late Government.

He also suggested "quite definitely and deliberately," that there was not a single charter operator who was recognized as fair by the trade unions within the industry. There was the Industrial Court award in 1949 which went against the independent air charter operators. They had never implemented that award, although it went in favour of the trade unions. In fairness, however, it had to be recorded that the trade unions later met the operators and agreed not to press the award because the field of operations of the charter companies was restricted.

Regarding charter operators, Mr. Lindgren alleged that in certain cases it was the practice of companies engaged in work other than civil air operations to charge the losses on civil air operations to their more profitable business of manufacture and repair. Sale of aircraft was another aspect where, according to Mr. Lindgren, there was a hidden subsidy because the price of aircraft sold by the Ministry was so low.

He commended the decision to press on with Gatwick Airport, which he believed was the only airport in this country which had good road and rail facilities, particularly rail facilities. This observation brought the comment from Sir Harold Webbe (Con., Cities of London and Westminster) that the rail facilities from Gatwick were "completely boneless."

Mr. J. S. Maclay (Nat. Lib., W. Renfrew), the former Minister for Civil Aviation, said it was surely no threat to the Corporation to say that if there was a new service not covered by them, at least the independents should have the opportunity to tender for it. This was particularly true in regard to freight services. Dealing with the advisory councils in Scotland, Wales and Northern Ireland, he suggested it was worth examining whether, if these councils were continued, the chairmen should also be members of the Board of B.E.A.

Mr. Clerwyn Hughes (Lab., Anglesey), made an appeal for extension of civil aviation to Wales, particularly in helicopter development.

A. Cdre. A. V. Harvey (Con., Macclesfield), said he could see nothing wrong with the York carrying freight over the North Atlantic. If it was an aircraft with a C. of A. it should be able to do the job all right. It would be flying at night and carrying freight, thus earning money for its operators and for the country. He did not think the Corporations would lose any traffic at all. There was business for everybody provided that there was good will on all sides, and he did not believe that morale in B.O.A.C. had gone down.

Although not wishing to detract from the improvement on the B.O.A.C. balance sheet, A. Cdre. Harvey pointed out that the mail rate was increased from the beginning of last year and there was a back law which would not recur this year. Also, B.O.A.C. had had hidden subsidies for a number of years. There was the case of the Solents, which were purchased for approximately £220,000 from Short and Harland in Belfast. They had been offered to independent operators for £30,000 each, but were hired by B.O.A.C. from the Minister of Supply. That charge fell on the taxpayer, but if that had to be taken into account, then B.O.A.C.s' balance sheet would not look as good as it did.

A. Cdre. Harvey then discussed mail rates, and recalled that last year the Post Office agreed to pay retrospectively from January 1st, 1951, an extra 3s 1d per ton for first-class mails, bringing the rate up to 14s 2d per ton. This rate was equivalent to 4.17 gold francs, while the international rate was six gold francs a ton. He wondered why the Post Office paid so little, when the Americans paid well over five gold francs per ton.

Speaking of charter operations, he observed that last year B.O.A.C. expenditure was £491,708 against the previous year's expenditure of just over £441,000. The revenue obtained last year was £962,000—almost double that of the previous year, £450,000. It looked as if the expenditure had been exactly the same while the revenue was doubled, and he wondered if this meant that overhead charges and expenditure were being absorbed by the scheduled services. He thought the fuel tax of £267,000 imposed on B.E.A. was exorbitant.

A. Cdre. Harvey believed the choice of Gatwick was probably right, but wondered if, in reference to Blackbushe, consideration had been given to a mono-rail through Camberley and up to London, joining with a similar rail coming in from Heathrow to the centre of London.

Mr. Frederick Gough (Con., Horsham), dealt extensively with the question of Gatwick Airport, and developed an elaborate argument to show that it was unsuitable. He felt that the new airport would have to be bigger than London Airport, and that it should be sited somewhere near water to allow for flying-boat development. Mr. Gough questioned the Minister's statement that one of the advantages of Gatwick was that it was on the continental side of London. He believed a suitable alternative might be found somewhere on the London estuary, which was no worse from the fog viewpoint than London Airport and would save 30 miles of flying-in and flying-out costs.

Mr. Ian Mikardo (Lab., Reading South), winding-up for the Opposition, enunciated the general attitude of his party to the Government's policy. Dealing with wages and conditions, he said it was quite possible to evade the requirement that private employers should not get their maintenance work done at cut prices. A number of companies had appeared before the Industrial Court for doing precisely that. He then referred to the personal inconvenience caused by the switching of labour from one part of the country to another, and said he would be very surprised if the workers in this industry accepted the situation.

Mr. Maudling Sums Up

Mr. Reginald Maudling, the Parliamentary Secretary, in closing the debate, referred to the question of trade union consultation, and stressed that the Government had expressed their willingness on several occasions to consult with the trade union side of the National Joint Council on any possible future changes in policy affecting their interest. The new terms of reference of A.T.A.C. made it quite clear that companies applying for an associate agreement or any new service must satisfy the N.J.C. provisions on terms and conditions. Dealing with the loss on the Bahamas operations, he noted the new arrangements where Bahamas Airways were restricted to internal routes, B.O.A.C. being left to run external routes.

Mr. Maudling said, in reference to mail rates, that the Government did not necessarily accept all that was said by the Corporations in their reports. It was to be observed that the B.E.A. rate had now been brought up from 2.9 gold francs to the international rate of three gold francs. He asked Members to bear in mind that comparisons between the mail rates for the different companies could be misleading. There was a great difference between the surcharged mail carried largely by B.O.A.C. and the short haul, all-up mail carried by B.E.A.

Discussing civil aviation generally, and re-stating the Government's aims, he said he protested against the restrictive attitude which so many people adopted. No one could foretell the range or the limits to be developed in the coming years, and it was essential to make use of every opportunity and every method of development that the genius and enterprise of our people could provide. He agreed that cut-throat competition must be avoided.

On the question of charter work, he did not think there was substance in the charge sometimes made that the Corporations were offering unnaturally low quotations on their non-scheduled operations to knock out the independents, and subsidize themselves with the relatively high charges they made on the scheduled services.

He then dealt with the African service. It had been agreed, he said, that the Corporation should maintain intact its first-class and tourist-class services. The Government considered that there was scope for a Colonial coach service. They wanted to keep a three-tier fare structure.

Obviously if that was to be done a proper differential must be maintained between the tourist class and the coach class, and the whole idea would be undermined if either the coach-class operator produced a tourist service disguised as a coach service, or vice-versa. It was true that the Government had received representations from independent companies against the Corporations, but, equally, they had received representations from the Corporations against some independent companies. In fact, the Government had pressed one independent company not to increase its fares but to bring down its baggage allowance and give-aways in order to be able to reduce its fare—because it was thought the fare could be lower—and thus reduce the differential.

Mr. Maudling said he had discussed the matter with the Corporations, and as a result no request had been made to the Corporations to increase any of their existing fares.

Dealing with freight, Mr. Maudling said he could not understand why there should be any confusion about the North-Atlantic freight route. It was true that B.O.A.C. at one time operated an all-freight route across the Atlantic, but this ended more than three years ago and at the latter stages was, in fact, merely a training operation on which a certain amount of freight was carried to make up. What made the matter quite beyond dispute was that the terms of reference to the A.T.A.C. made a clear distinction between existing routes and new routes. Any licence given to a private company for North Atlantic operations would not be exclusive. If the Corporation could say that there was more traffic to be carried than was being carried, and a large market which they could meet, they obviously would also be able to operate.

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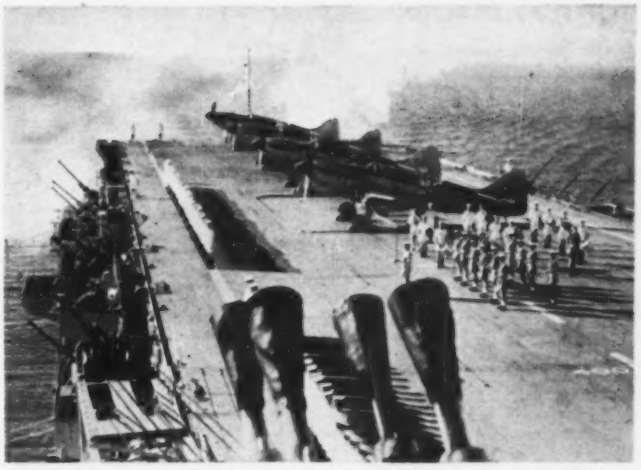
SERVICE AVIATION

Royal Air Force and Naval Aviation News



NAVAL SALUTE : The scene on the flight deck of H.M.S. "Theseus" while a 13-gun salute was being given to the flag of Rear-Admiral J. S. Stevens, Flag Officer Home Fleet Training Squadron, in H.M.S. "Implacable."

The Biggin Hill Ceremony

BAD weather robbed last Saturday's ceremonial inspection of Nos. 600 and 615 Squadrons of some of its interest. The parade was held in a hangar, and both the fly-past and march-past were cancelled. Nevertheless, the scene inside the hangar was impressive as, precisely on time, Queen Elizabeth the Queen Mother, Honorary Air Commodore of No. 600 (City of London) Squadron, and Mr. Winston Churchill, Honorary Air Commodore of No. 615 (County of Surrey) Squadron, arrived together for the joint inspection of their units. The royal car, in which Mr. Churchill accompanied the Queen Mother, was preceded by another, in which the Station Commander, W/C. Pitt-Brown and Colonel the Lord Cornwallis, the Lord Lieutenant of Kent, led the way.

The Guard of Honour had been drawn from No. 2600 (City of London) L.A.A. Squadron, of which unit the Queen Mother is also the Honorary Air Commodore. It is commanded by S/L. A. G. Collings, who was also in charge of the Guard.

The main parade was drawn up with the two squadrons in line facing the dais. No. 600, commanded by S/L. J. P. Meadows, on the left, and No. 615, commanded by S/L. F. B. Sowrey, on the right. As the inspecting officers mounted the dais, the R.A.F. Central Band played the National Anthem and, simultaneously, the Queen Mother's personal standard was broken from a staff in front of her squadron and the standard of the Warden of the Cinque Ports unfurled in front of No. 615 Squadron.

In his capacity as officer commanding the parade, S/L. Meadows reported the squadrons ready for inspection. The Queen Mother then proceeded to inspect No. 600 Squadron, accompanied by S/L. Meadows and F/L. Hawker, the Auxiliary adjutant. Immediately behind came Mr. Churchill with S/L. Sowrey, Air Marshal Sir Basil Embry, A.O.C.-in-C. Fighter Command, A.V-M. The Earl of Bandon, A.O.C. No. 11 Group, A. Cdre. D. G. Morris, Sector Commander, and W/C. W. Pitt-Brown, Station Commander.

The inspection was most thorough; the entourage passed along all of the ranks, and the Queen Mother stopped to talk with many of the officers and men. As the inspecting party moved from No. 600 to No. 615 Squadron, S/L. Sowrey joined the Queen Mother, and S/L. Meadows then accompanied Mr. Churchill. F/L. Hawker returned to his squadron, and his place was taken by F/L. R. Spillingford, the Auxiliary adjutant of No. 615.

The inspection completed, S/L. Meadows called for three cheers for the Queen Mother. These were given in the traditional style with head-dress removed. The cheers were led by Mr. Churchill. Before leaving the hangar the Queen Mother inspected one of her squadron's Meteor 8s. Later, in the officers' mess, a number of the guests—many of them ex-officers of the two squadrons—were presented to the Queen Mother and Mr. Churchill. The Prime Minister had a special word with S/L. Neville Duke. (It is not generally known that Mr. Churchill sent a personal note to S/L. Duke on the occasion of his making a supersonic flight at Farnborough immediately after John Derry's accident.) Among the many people present were Lord and Lady De L'Isle and Dudley, Mr. George Ward, Mrs. Winston Churchill and Mrs. Christopher Soames.

Her Majesty Queen Elizabeth the Queen Mother has been Honorary Air Commodore of No. 600 Squadron since August, 1949, and this is the second occasion on which she has inspected her squadron at Biggin Hill, although she has visited the town headquarters at Finsbury Barracks. Mr. Churchill's appointment as Honorary Air Commodore of No. 615 dates back to April, 1939, and the uniform he was wearing last Saturday bore the wings that were awarded to him in recognition of his many services to the Royal Air Force. Among the posts held by Mr. Churchill in the past was that of Secretary of State for Air from 1919 to 1921.

AT BIGGIN HILL: (Left) The Queen Mother, attended by S/L. J. P. Meadows, chatting with P/O. C. Muntz, one of the pilots of No. 600 (City of London) Squadron. (Right) Mr. Winston Churchill in R.A.F. uniform with S/L. F. B. Sowrey, who is the C.O. of No. 615 (County of Surrey) Squadron.

SERVICE AVIATION . . .

Wings for the Duke?

DEPENDING upon whether his numerous official engagements leave him sufficient spare time, H.R.H. The Duke of Edinburgh may accept the Air Council's invitation to learn to fly with the Royal Air Force. If he decides to take his wings he will be asked to accept an honorary rank in the R.A.F., and it is thought probable that one of the senior instructors at Cranwell would give him his air tuition.

King George VI and Edward VIII both learned to fly; their father, George V, wore "honorary" wings, for he had not received instruction.

Command Appointment

HER MAJESTY THE QUEEN has approved the appointment of A.V-M. L. G. Harvey, C.B., as A.O.C.-in-C. Maintenance Command, with the acting rank of air marshal.

For the past two years A.V-M. Harvey has held the post of S.A.S.O., Technical Training Command; previously he was A.O.C. No. 24 Group. He was originally commissioned in the Royal Warwickshire Regiment and was seconded to the Royal Flying Corps in 1917. He will take up his new post in December.

Air Council Changes

CERTAIN changes, already announced, in the constitution of the Air Council took effect last week-end.

On Friday, October 31st, Air Marshal Sir Francis J. Frogarty, K.B.E., C.B., D.F.C., A.F.C., took up the appointment of Air Member for Personnel in succession to Air Chief Marshal Sir Leslie N. Hollinghurst, G.B.E., K.C.B., D.F.C., who is retiring.

On Saturday, November 1st, Air Chief Marshal Sir John W. Baker, K.C.B., M.C., D.F.C., the present Deputy Chief of the Air Staff, assumed the title of Vice-Chief of the Air Staff; he will, however, continue to perform his present duties.

On the same day Air Marshal Sir Ronald Ivelaw-Chapman, K.B.E., C.B., A.F.C., took up his appointment as Deputy Chief of the Air Staff, with responsibilities for the duties hitherto allocated to the post of Vice-Chief of the Air Staff. The former Vice-Chief, Air Chief Marshal the Hon. Sir Ralph A. Cochrane, G.B.E., K.C.B., A.F.C., A.D.C., is retiring from the R.A.F.

By the end of the year, when Marshal of the Royal Air Force Sir John C. Slessor, G.C.B., D.S.O., M.C., hands over his post of Chief of the Air Staff to Air Chief Marshal Sir William F. Dickson, K.C.B., K.B.E., D.S.O., A.F.C., there will have been a complete change in the composition of the Service side of the Air Council in the space of four months—except for the post of Controller of Supply (Air), Ministry of Supply, which Air Marshal Sir John Boothman will continue to occupy.

Air Chief Marshal Sir William Dickson, now on a world tour of R.A.F., Commonwealth and American air bases preparatory to taking up the post of C.A.S., was Air Member for Supply and Organization until September 1st, when he was succeeded in this post by Air Marshal Sir John Whitworth Jones, K.C.B., C.B.E.

George Medal

FOR the part he played in an accident to an Auster belonging to the Arab Legion at Ras-el-Negeb, W/O. G. T. Keith has been awarded the George Medal. W/O. Keith was the passenger in the aircraft and, although injured, burned and dazed, he managed to extricate the pilot from the blazing wreckage and carry him to safety.

W/O. Keith at the time was on loan to the Arab Legion Air Force at Amman.

No. 82 Squadron Return

THE return to Britain last Friday of an Avro Lancaster, piloted by W/C. S. G. Wise, marked the successful termination of an exceptional photographic reconnaissance task on which No. 82 Squadron have been engaged for the past six years. Altogether, nearly a million and a quarter square miles have been photographed in various parts of the African continent.

No. 82 is the last Bomber Command squadron to have Lancasters and will shortly convert to P.R. Canberras.

Carrier Appointments

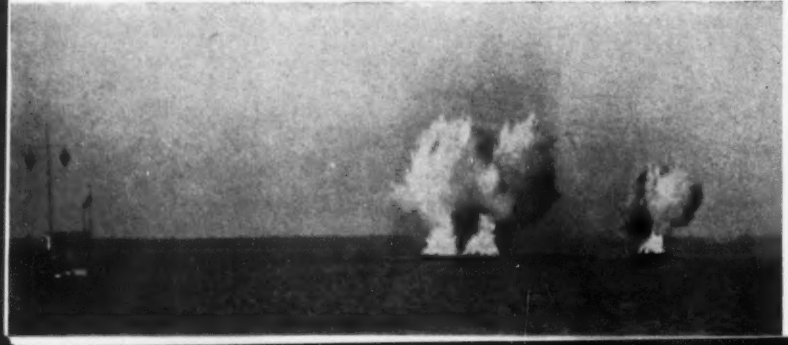
THE following appointments have been announced by the Admiralty: Capt. E. D. G. Lewin, D.S.O., D.S.C., to command H.M.S. *Perseus*; Capt. A. F. Campbell, O.B.E., to go to H.M.S. *Implacable* in command and also as Flag Captain and Chief Staff Officer to the Flag Officer Training Squadron; Capt. B. E. W. Logan to command H.M.S. *Ocean*, the carrier which recently completed a tour of duty in Korean waters.

Rocketing on Steinhuder Meer

NOW back in London after attending a conference at Headquarters, 2nd A.T.A.F., Air Vice-Marshal Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., Assistant Chief of the Air Staff (Operations), took the opportunity during his visit to Germany of watching a rocket demonstration by four Vampires based at Fassberg. Other senior officers present included A.V-M. J. H. Edwardes-Jones, C.B.E., D.F.C., A.F.C., S.A.S.O., H.Q. 2nd A.T.A.F., A. Cdre. H. D. McGregor, C.B.E., D.S.O., A.O.C. No. 2 Group, 2nd A.T.A.F., Rear Admiral R. St. V. Sherbrooke, V.C., Flag Officer, Germany, and Maj-Gen. C. S. Sugden, C.B., C.B.E., Chief of Staff, British Army of the Rhine.

The target chosen for the demonstration was a 100-ft pontoon bridge moored on Steinhuder Meer, a big lake north-west by west of Hanover. When it was all over, someone retrieved a dead fish (or was it just stunned?) from the water and presented it to G/C. E. M. Donaldson, D.S.O., A.F.C., who commands R.A.F. Fassberg. The inscription ran: "32 rockets and look what I hit!"

BANG ON: A salvo of rockets explodes on the pontoon target moored on Steinhuder Meer, near Hanover (see "Rocketing on Steinhuder Meer," on this page).



WITH THE R.A.A.F.: Air Chief Marshal Sir William Dickson, who is to be the new C.A.S. next January, inspecting a guard of honour during his recent visit to the R.A.A.F. at Laverton, Australia.

W.R.A.F. Appointments

THREE W.R.A.F. appointments in the rank of Group Officer are announced by the Air Ministry. G/O. M. H. Barnett, O.B.E., is to be Officer Commanding W.R.A.F. Depot, Hawkinge, Kent; G/O. A. Stephens, M.B.E., is to be Inspector of the W.R.A.F., and G/O. L. H. Turner, O.B.E., will become W.R.A.F. Staff Officer at Home Command Headquarters.

R.Aux.A.F. Coronation Functions

FOLLOWING the recent announcement of a R.Aux.A.F. Coronation Ball, to be held on May 29th next, for past and present officers and their guests, comes the further announcement that the Combined London R.Aux.A.F. Units Committee are also organizing a ball, which will be held at the Royal Festival Hall on June 5th. Tickets (17s 6d, including buffet) are obtainable from the hon. secretary, Combined R.Aux.A.F. Units Committee, 17-19, Queen's Square, London, W.C.1. This function will, of course, be for all ranks.

Particulars of the May 29th ball are obtainable from F/O. P. F. Johnson, Woodside, South Ascot, Berkshire.

Reunion

THE annual dinner of the R.A.F. (Middle East) 1914-23 club will be held at the R.A.F. Club, Piccadilly, London, on Monday, November 10th. A.V-M. A. E. Barton will be in the chair. Tickets (35s) from S/L. A. D. L. Carroll, Langley, Saffron Walden, Essex.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The D.H.4

From Air Chief Marshal Sir Frederick Bowhill, G.B.E., K.C.B., C.M.G., D.S.O., R.A.F. (rtd.)

IN the interesting article about the D.H.4 in your issue of October 17th mention is made of the fact that the type was used in North Russia in May 1918. It may be of interest to record that D.H.4s were also used in South Russia.

Directly after the war had finished I was told to get aircraft ready to proceed to South Russia to support the naval contingent which was working on the Caspian, and we arrived in Baku, as far as my memory serves, early in January 1919. The aircraft did various bombing raids on Astrakhan, etc., in support of the operations of the Navy, with which we worked in close conjunction. We were recalled in October 1919 owing to change of policy of the British Government.

Ministry of Civil Aviation, London, W.C.1. F. W. BOWHILL.

I READ with interest the article "The De Havilland D.H.4." Strange to relate, I came across a very old newspaper cutting a week previously, with reference to the D.H.4. It was probably cut out by my father, but no date was to be seen. I enclose the cutting, which may be of interest to you.

May I say "thank you" for a wonderful publication?

Witney, Oxford. L. V. R. SEELY.

[Headed "800 Miles an Hour—General Seely's Dream of Air Travel," the cutting forwarded by Mr. L. V. R. Seely is quoted below. It almost certainly appeared in the early part of 1919.—ED.]

"Major-General Seely, the chief British representative on the Imperial Air Commission, who flew to Paris in record time, states that a remarkable chance discovery has resulted in obtaining an increased speed for aeroplanes.

"It was decided to cover in the passengers' seat on a D.H.4 aeroplane, for the comfort and convenience of important personages travelling by air between London and Paris, and it was found that the cabin decreased the resistance offered to the air, with a consequent increase of speed of about ten miles an hour, an increase which would otherwise only have been attained by adding about 90 horse-power to the engine capacity.

"General Seely, who was the guest yesterday at a dinner given at the Ritz Hotel by Sir George Riddell to the British correspondents, said he was assured by experts that there are no reasons why aeroplanes should not travel at 800 miles an hour before long, which would enable one to breakfast in London and lunch in New York."

MANY people must have some conception of absolute perfection, and the nearest I have seen to my preference was J. M. Bruce's comprehensive article on the D.H.4, which appeared in *Flight* of October 17th.

A point which occurs to me is that there must be many readers to whom an article like this lights a slow fuse of memory which reveals many personal modifications known to a limited number of people. Post-war articles on the Spitfire revealed something of the sort of things I refer to. Would it be too much to suggest that the several organisations and individuals now engaged in aeronautical historical researches could provide a centre to which such facts could be committed?

Parkstone, Dorset. JOHN GAYLARD, Combined Spotter's Clubs Organization.

Exercises and the R.O.C.

I HAVE just read with profound interest your accounts of Exercise Ardent, including the part played by the Royal Observer Corps therein—particularly by "Dog Three" post, situated above a telephone exchange, and practically on Northolt's doorstep so to speak.

In comparison, although R.O.C. personnel in the south-west tip of England may envy those who watch the never-empty skies of the Home Counties, I wonder how many posts there have such an excellent geographical position as ours—"Easy Two," 21 Group, which is well over 500ft above sea-level on the well-known cliffs of Peak Hill, where one can see Portland Bill, Start Point and the tors on Dartmoor at the same time—the observer's dream of good visibility.

However, during Exercise Ardent the raids on this part of the country were very few and far between, and this has been the case during the past two or three years' autumn defence-exercises. Surely, if the whole country's defence system is to be challenged then let's assume that France is partially occupied by an enemy and that from there aircraft in strong formation might attack, say, Plymouth and Cornwall, perhaps with parachute troops thrown in. It would then be possible to determine just how well our fighters could hold their own, for range and endurance, away from their usual haunts in the Midlands and Eastern Counties.

Sidmouth, Devon. N. C. COLLIER, Leading Observer, R.O.C.

Security or . . . ?

WATCHING (as many others) from the Cambridge-Ely road (A.10), activity at R.A.F. Station Waterbeach during Exercise Ardent I (and many others) could easily read the number on the squadron crests painted on the nacelles of the Meteors dispersed on the other side of the hedge.

A potential enemy could no doubt see these also, and find out similar information from other aerodromes situated near roads, as indeed so many are. A visit to an "At Home" during Battle of Britain celebrations will also give information about squadrons. These are simple methods, and there are plenty of others open to anyone with the time and money to seek facts. I cannot work out the reason why so much information is restricted, for it is now so easy to discover that our friends beyond the Iron Curtain must know far more than the public, assuming the information interests them; but I suppose that if someone pointed that out to the Air Ministry they will scrape all the paint from our aeroplanes.

Cambridge. PEDANTICA.

Supersonic Phenomena

I DO not think Mr. C. H. E. Warren (in his article in *Flight* of October 17th) and Mr. Diprose (to whom he makes acknowledgment) have quite got to the bottom of this yet. That some concentration of sound from the shock-waves of an aircraft is liable to occur whenever the velocity-component along the line to the observer is sonic is fairly evident. No balloons are needed to demonstrate this; in fact, they simply fog the issue.

However, on this argument it is quite easy to see that bangs would occur over a fairly wide area every time an aircraft goes supersonic, and this I believe is not so. There is, therefore, some further question of the precise path of the aircraft and its curvature involved, in addition to the previously recognized factor of the duration of the transonic phase, or acceleration (and deceleration) through M-1.

Trondheim, Norway. J. LOCKWOOD TAYLOR.

THE recent loss of the D.H.110 at Farnborough calls to mind another tragedy, when Geoffrey de Havilland lost his life over the Thames estuary. On that occasion it occurred to me that no man would ever survive flight at the speed of sound unless he had a noiseless machine.

It is well known that sound, as a sensation perceived by the ear, emanates in every case from a vibrating body. The vibrations are transmitted from the source to the ear-drums by wave-like alternations of pressure and expansion in the air or other medium. Pitch depends on wave-length, intensity on amplitude, quality on regularity of wave-form. But the velocity of any sound depends only on the temperature, pressure and other physical conditions of the medium of transmission. In air at normal conditions the velocity of sound of any kind is about 1,100ft/sec, or 750 m.p.h.

If a stationary aircraft is running its engines the sound is transmitted in all directions (apart from the solid ground) at the same speed. When the machine takes off and gains speed in one direction the engine sound travelling in that direction loses speed relative to the pilot because he is (as it were) pursuing the sound. When the aircraft reaches the speed of sound the engine sound relative to the pilot is zero in the forward direction; in fact, the sound does not leave the aircraft in that direction, but builds up by superposition of wave upon wave in one instant of time—sufficient, perhaps, to break the pilot's ear-drums and cause him to lose control.

The objection that modern aircraft have soundproof cockpits and that the pilot hardly hears his own engines can be countered by the consideration that a sound capable of breaking a man's ear-drums has only to be multiplied a certain amount to break the cockpit canopy or even the aircraft structure itself. Why, then, does this not happen more frequently? The reason, I suggest, is that the speed does not as a rule remain for long at 750 m.p.h. but passes it in an instant and re-passes it on falling below the critical speed. Only in exceptional cases does the aircraft speed hover around the speed of sound for perhaps a few seconds, sufficient to generate a disruptive vibration.

This theory may offer an explanation of the "bangs" heard by spectators and of the "barrier" of air resistance experienced by

CORRESPONDENCE . . .

the aircraft. I suggest the latter is Nature's reaction to the abnormal condition of a material thing chasing its own sound, while the "bangs" are evidence of excessive vibration caused by the superposition of a number of sounds at one instant of time. It should not be overlooked that the pilot and the spectators are in very different circumstances. The spectators are stationary and only hear the actual sound due to the build-up of pressure waves, but the pilot and his aircraft experience also an excessive blast or vibration, because they are travelling with the sound.

London, S.W.9. GORDON FIELD.

"Aerial Advertising" in 1910

IN your report (October 24th) on the "Aerophilately" exhibition, it is stated that Cody dropped the pamphlets advertising Capt. Arthur Wood's concert in 1909.

It is true that the photograph exhibited is of the 1909 machine, but the machine from which the pamphlets were dropped did not fly until 1910. It won the Second Michelin No. 1 Trophy on December 31st, 1910, with a flight of 185½ miles in 4 hours 47 minutes. On February 4th, 1911, it made the first "airliner" flight; two of us had to stand on the leading edge, as there was only one passenger seat—for three people—in addition to Cody. We were, therefore, the first "aerial straphangers." You will see a photograph of this in *Flight* for February 11th, 1911.

About the pamphlets: Cody would not let us use a knife to cut the string when dropping the bundles of 500, so we tied slip-knots. The papers wrapped themselves around the wires and struts of the aeroplane and looked like an invasion of locusts chasing us when we looked back. M. Bizion—son of the Empress Eugenie's chef—dropped the first lot, and I the second. We used a newsboy's bag from the bookstall at Aldershot Station to carry them in.

The police warned Cody that he would be prosecuted if he tried it again, so I hope no one repeats it at the S.B.A.C. Show next year, as jokingly suggested in your article.

Incidentally, I have just written Cody's biography, which will be published shortly; Sir Geoffrey de Havilland has written a foreword to it and "C.G.G." an appreciation of Cody. Next year is the 50th anniversary of his first heavier-than-air flight from a warship—six months before the Wrights flew. This was, of course, the birth of the Fleet Air Arm, and I believe has been so described in an article published recently in a Service journal.

Virginia Water, Surrey. W. BROOMFIELD.

FORTHCOMING EVENTS

We publish below one of our periodical lists giving details of the branch, as well as the main, lectures and other fixtures of the R.Ae.S. and other societies, which are too numerous for regular inclusion each week. The list below gives fixtures up to the end of the year.

Nov. 7. Helicopter Association: "Operational Future of the Helicopter," by P. G. Masefield, M.A.(Eng.), F.R.Ae.S.
Nov. 8. British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Nov. 8. British Interplanetary Society, Birmingham Branch: "Rocket-motor Combustion Dynamics," by E. T. B. Smith, D.C.Ae., Grad.I.Mech.E., A.F.R.Ae.S.
Nov. 10. R.Ae.S. Bristol Branch: "Structural Developments in Ships," by J. C. Lawrence, B.Sc.
Nov. 11. S.L.A.E. (Blackbushe): Lecture on Goodyear Tyres.
Nov. 12. Institute of Transport: Anniversary Luncheon.
Nov. 12. R.Ae.S.: First R. K. Pierson Memorial Lecture: "Rex Pierson—an Appreciation and the Lessons of his Work," by Sir A. H. Roy Fedden, M.B.E., D.Sc., M.I.Mech.E., F.R.S.A., M.S.A.E., F.R.Ae.S. (Lecture at Weybridge).
Nov. 12. R.Ae.S. Brough Branch: "Meteorological Service for B.O.A.C. Comet Operation," by E. Chambers.
Nov. 12. R.Ae.S. Luton Branch: "Trainer Aircraft," by W/C. Wroath.
Nov. 12. R.Ae.S.: Manchester Branch: "Glass as a Structural Material," by A. J. Holland.
Nov. 13. R.Ae.S. Isle of Wight Branch: "Development of the Bristol Proteus," by Dr. S. G. Hooker, O.B.E., A.R.C.Sc., B.Sc., D.I.C., D.Phil., F.R.Ae.S., F.R.S.A.
Nov. 14. R.Ae.S. Graduates' and Students' Section: "Liquid Fuel Rocket Motors"—Three Papers, by B. R. Diplock, B.Sc., Grad. I. Mech. E., Grad.R.Ae.S., D. L. Lofts, Grad.R.Ae.S., and R. A. Grimston, Grad. I. Mech.E., Grad.R.Ae.S.
Nov. 14. R.Ae.S. Glasgow Branch: "Servo-Mechanisms," by A. J. H. Cruickshank.
Nov. 15. British Interplanetary Society, Manchester Branch: "Rocket-motor Combustion Dynamics," by E. T. B. Smith, D.C.Ae., Grad. I.Mech.E., A.F.R.Ae.S.
Nov. 17. R.Ae.S. Halton Branch: "Rocket Propulsion and Interplanetary Travel," by A. V. Cleaver, F.R.Ae.S.
Nov. 18. R.Ae.C.: Film Show, Londonderry House.
Nov. 18. R.Ae.S. Graduates' and Students' Section: "An Introduction to Helicopters," by J. D. Sibley, B.Sc., Grad.R.Ae.S.
Nov. 19. Royal United Service Institution: "The Bismarck' Operation in the Light of German Records," by Cdr. R. P. Jessel, D.S.O., D.F.C., R.N.
Nov. 19. R.Ae.S. Bristol Branch: "Britain's Economic Position," by Sir Cecil Weir, K.B.E., K.C.M.G., M.C.
Nov. 19. R.Ae.S. Coventry Branch: "Helicopters," by Raoul Hafner.
Nov. 19. R.Ae.S. Reading and District Branch: "Sabres in Korea," by Lt.-Cdr. J. Bailey, R.N.
Nov. 19. Aircraft Recognition Society: Meeting. Guest speaker, C. H. Gibbs-Smith, M.A.
Nov. 20. R.Ae.S. Section Lecture: "Design of a Wind Tunnel Balance," by L. E. Leavy, A.F.R.Ae.S., and C. J. Saunders.
Nov. 20. S.L.A.E. (Bristol): "Aviation Fuels and Lubricants," by J. R. Bradford.
Nov. 20. R.Ae.S., Isle of Wight Branch: Annual Dinner.
Nov. 20. R.Ae.S., Portsmouth Branch: Film Show.
Nov. 21. Institute of Navigation: "The Vertical Reference in Navigation," by W. A. W. Fox and D. Barnett.
Nov. 21. R.Ae.S. Leicester Branch: "Structure Weight," by J. Taylor.
Nov. 25. Society of Instrument Technology: Symposium on "Control Valves." Papers by A. R. Aikman, B.Sc., H. R. Walton, B.Sc., A.M.I.Mech.E., and B. W. Balls, B.Sc., A.M.I.Chem.E.
Nov. 25. R.Ae.S. Bristol Branch: "Developing Aviation Fuels and Lubricating Oils," by C. B. Davies.
Nov. 25. R.Ae.S. Belfast Branch: "The Role of Aircraft in Future Warfare," by Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C., R.A.F. (retd.).
Nov. 25. Plymouth Aircraft Recognition Society: Film Show.
Nov. 25. S.L.A.E. (Blackbushe): Film Show.
Nov. 25. S.L.A.E. (Bournemouth and Christchurch): A.S.T. Brains Trust.
Nov. 26. R.Ae.S. Birmingham Branch: Visit to University of Birmingham Civil Engineering Department.
Nov. 26. R.Ae.S. Southampton Branch: "Structural Problems of Advanced Aircraft," by H. H. Gardner.
Nov. 27. R.Ae.S.: "Photo-elasticity and Aircraft Research," by Col. H. T. Jessop, T.D., M.Sc., F.Inst.P.
Nov. 27. R.Ae.S., Isle of Wight Branch: "The Helicopter for Passenger Transportation," by Raoul Hafner.
Nov. 29. S.L.A.E.: "The Bristol Proteus Gas Turbine," by D. Dekkers.
Nov. 29. R.Ae.S. Halton Branch: Visit to the N.P.L.
Dec. 1. R.Ae.S. Derby Branch: "Metallurgical Problems Imposed by Stratospheric Flight," by Major P. L. Teed, F.R.Ae.S., M.Inst.Met., M.I.M.M., F.Phy.S., Assoc. R.S.M.
Dec. 1. R.Ae.S. Halton Branch: Lecture by a representative of Dowty Equipment, Ltd.
Dec. 2. S.L.A.E. (Blackbushe): Film Show.
Dec. 2. R.Ae.S. Graduates' and Students' Section: "Aerodynamics of Wind Tunnel Design," by J. C. Gibbings, Ph.D., B.Sc.(Eng.), Grad.R.Ae.S.
Dec. 3. Royal United Service Institution: "The Air Battle," by Air Chief Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Dec. 3. R.Ae.S. Luton Branch: "Airships," by Lord Ventry.
Dec. 3. R.Ae.S. Weybridge Branch: "Airline Flying from the Pilot's Point of View," by Capt. R. Rymer.
Dec. 4. R.Ae.S. Section Lecture: "Air Traffic Control Today and Tomorrow," by Capt. V. A. H. Hunt, A.F.R.Ae.S.
Dec. 4. R.Ae.S. Portsmouth Branch: Lecture by H. C. R. Robinson, Wh.Sch.A.C.G.I., B.Sc.(Hons.).
Dec. 5. Helicopter Association: "Simulation of Flight Loads by Ground Tests," by M. J. Brennan, B.Sc., and R. Hafner.
Dec. 5. Herts and Essex Aero Club: Annual Dinner and Dance.
Dec. 6. Northern Heights Model Flying Club: Annual Dinner and Dance.
Dec. 8. R.Ae.S. Bristol Branch: "High-altitude Balloon Flights," by Prof. C. F. Powell, F.R.S.
Dec. 8. R.Ae.S. Halton Branch: Branch Night and Committee Meeting.
Dec. 10. R.Ae.S. Brough Branch: "Aircraft Propulsion," by Prof. A. D. Baxter.
Dec. 10. R.Ae.S. Reading Branch: "Industrial Design and the Engineer," by K. Brookfield.
Dec. 10. R.Ae.S. Southampton Branch: First Mitchell Memorial Lecture, by J. Smith, C.B.E.
Dec. 10. R.Ae.S., Manchester Branch: "Evolution of the Design of an Aircraft," by Prof. R. L. Lickley, B.Sc., D.I.C., M.I.Mech.E., F.R.Ae.S.
Dec. 11. R.Ae.S. Isle of Wight Branch: Annual General Meeting, and Film Show.
Dec. 11. S.L.A.E. (Bournemouth and Christchurch): Social Evening.
Dec. 12. R.Ae.S. Birmingham Branch: "Guided Missiles," by W. H. Stephens.
Dec. 12. R.Ae.S. Bristol Branch: Engineering Association's Joint Dance.
Dec. 13. British Interplanetary Society: "Guidance and Control of Missiles," by J. Humphries, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S.
Dec. 13. British Interplanetary Society, Birmingham Branch: "Fundamentals of Nuclear Energy Generation," by Dr. D. C. Leslie, M.A.
Dec. 16. R.Ae.S. Graduates' and Students' Section: "An Introduction to Aircraft Vibration," by D. J. Mead, D.C.Ae., Grad. R.Ae.S.
Dec. 16. R.Ae.S. Bristol Branch: Presidential Lecture, by Dr. A. E. Russell, B.Sc., F.R.Ae.S., F.I.Ae.S.
Dec. 16. R.Ae.S. Glasgow Branch: Lecturettes.
Dec. 16. R.Ae.C.: Film Show, Londonderry House.
Dec. 16. S.L.A.E. (Blackbushe): Film Show.
Dec. 16. R.Ae.S. Belfast Branch: Lecturettes—"Modern Trends in Wing Primary-bending Structures," by K. G. Legg, D.C.Ae., B.Sc., A.M.I.Mech.E., A.F.R.Ae.S. "Seaplane Model Testing Technique," by P. W. Brown, B.Sc., A.F.R.Ae.S.
Dec. 16. R.Ae.S. Belfast Branch: Lecturettes.
Dec. 17. R.Ae.S. Coventry Branch: Film Show.
Dec. 17. R.Ae.S. Weybridge Branch: "Fatigue," by Major P. L. Teed, F.R.Ae.S., M.Inst.Met., M.I.M.M., F.Phy.S., Assoc. R.S.M.
Dec. 17. Institute of the Aeronautical Sciences, New York: Sixteenth Wright Brothers Lecture.
Dec. 17. Aircraft Recognition Society: Brains Trust.
Dec. 18. R.Ae.S.: Full-day Discussion on "Fatigue."
Dec. 18. R.Ae.S. Portsmouth Branch: Film Show.
Dec. 18. S.L.A.E. (Bristol): "Aircraft Wheels and Brakes," by a Goodyear Tyre and Rubber Co. representative.
Dec. 19. R.Ae.S. Weybridge Branch: Annual Dance.
Dec. 20. British Interplanetary Society, Manchester Branch: "Rocket-motor Testing," by D. Hurden, B.A.
Dec. 30. Plymouth Aircraft Recognition Society: Meeting.

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AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

Application No. 86 from Airwork, Ltd., of 15, Chesterfield Street, London, W.1, for an All Freight service with Bristol 170 aircraft, for the carriage of Freight and Mail between London (Blackbushe) and Basra and Ali (Trucial Coast) with intermediate traffic stops at Nicosia, Tripoli (Lebanon), Kirkuk, Baghdad, Basra, Kuwait, Dhahran and Dukhah (Qatar Peninsula), at a frequency of from two to five services weekly to one daily, during the period from February 1st, 1953 to January 31st, 1960.

FROM: Hunting Air Transport, Ltd., of 55, Pall Mall, London, S.W.1:—

Application No. 89 for a U.K. Internal service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and London (Bovingdon) at an initial frequency of two services daily, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 90 for a U.K. Internal service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Manchester (Ringway), at an initial frequency of one service daily, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 91 for a U.K. Internal service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Glasgow (Renfrew) at an initial frequency of one service daily, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 92 for a Normal Scheduled service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Stockholm, with an intermediate traffic stop at Oslo, at an initial frequency of up to three services weekly during the period from April 1st, 1953 to March 31st, 1960.

Application No. 93 for a Normal Scheduled service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Copenhagen, with an intermediate traffic stop at Hamburg, at an initial frequency of up to three services weekly, during the period from April 1st, 1953 to March 31st, 1960.

(continued on Col. 3)

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(continued from Col. 1)

Application No. 94 for a Normal Scheduled service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Dusseldorf, with an intermediate traffic stop at Amsterdam, at an initial frequency of up to three services weekly, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 95 for a Normal Scheduled service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail, between Newcastle (Woolsington) and Basle, with an intermediate traffic stop at Luxembourg, at an initial frequency of up to three services weekly, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 96 for a Normal Scheduled service initially with Dakota and later with Viking aircraft, for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Lyons, with an intermediate traffic stop at Paris, at an initial frequency of up to three services weekly, during the period from April 1st, 1953 to March 31st, 1960.

Application No. 97 from Bess Flight, Ltd., of Sandown Airport, Sandown, Isle of Wight, for a U.K. Internal service with DH.89A and Gemini aircraft for the carriage of passengers and supplementary freight between Isle of Wight (Sandown) and Portsmouth, at an initial frequency of from four to 10 services daily, during the period from May 1st, 1953 to September 30th, 1953.

Application No. 98 from Transair, Ltd., of Croydon Airport, Croydon, Surrey, for a U.K. internal seasonal service with Avro Anson and Dakota aircraft, for the carriage of passengers, supplementary freight and mail between London (Croydon) and Jersey-Guernsey, at a frequency of up to two services on Fridays and six services on Saturdays, during the period from May 1, 1953 to April 30, 1959.

Application No. 99 from Starways, Ltd., of Speke Airport, Liverpool, for a Seasonal Inclusive Tour service with Dakota aircraft, for the carriage of passengers and supplementary freight between Liverpool (Speke) and Bilbao (Sondica) at an initial frequency of from one service fortnightly to one service weekly, during the period from June 1, 1953 to September 30, 1957.

FROM Air Navigation and Trading Co., Ltd., of Blackpool Airport, Blackpool:—

Application No. 100 for a U.K. internal service initially with DH.89A and Avro Anson aircraft, for the carriage of passengers and mail between Carlisle (Kingstown) and Isle of Man (Ronaldsway), at a frequency of up to 32 services weekly, and additional services in accordance with traffic demand, during the period from May 31, 1953 to May 30, 1960.

Application No. 101 for a U.K. internal service initially with DH.89A and Avro Anson aircraft, for the carriage of passengers and mail between Newcastle (Woolsington) and Isle of Man (Ronaldsway) with an intermediate traffic stop at Carlisle, at a frequency of up to 32 services weekly, and additional services in accordance with traffic demand, during the period from May 31, 1953 to May 30, 1960.

FROM East Anglian Flying Services, Ltd., of Southend Airport, Southend-on-Sea, Essex:—

Application No. 102 for a normal scheduled service initially with DH.89A aircraft, for the carriage of passengers, supplementary freight and mail between Portsmouth and Paris (Le Bourget) with intermediate traffic stops at Shoreham and Dieppe, at an initial frequency of from one to three services daily, during the period from April 1, 1953 to March 31, 1960.

Application No. 103 for a U.K. internal service initially with DH.89A aircraft for the carriage of passengers, supplementary freight and mail between Land's End (St. Just) and Scilly Isles (St. Mary's), at an initial frequency of from three to 20 services daily, during the period from January 1, 1953 to December 31, 1959.

Application No. 104 from Hunting Air Transport Ltd., of 55 Pall Mall, London S.W.1, for a Colonial coach service with Viking aircraft, for the carriage of passengers and supplementary freight between London (Bovingdon) and Dar-es-Salaam (Tanganyika) with intermediate traffic stops at Malta, Wadi Halfa, Khartoum, Juba, Entebbe and Nairobi, at a frequency of one service weekly, during the period from January 1, 1953 to December 31, 1959.

Application No. 105 from Murray Chown Aviation, Ltd. of Staverton Airfield, Cheltenham, Gloucester, for a U.K. internal service initially seasonal and with DH.89A aircraft and later with D.H Dove aircraft, for the carriage of passengers and supplementary freight between Cheltenham (Staverton) and Guernsey-Jersey, with an intermediate traffic stop at Bournemouth at a frequency of from three to 14 services weekly, during the period from April 3, 1953 to April 2, 1960.

FROM B.K.B. Aerocharter, Ltd., of 13a, Old Burlington Street, London, W.1.:—

Application No. 106 for a Seasonal Inclusive Tour service with Dakota aircraft for the carriage of passengers between Southend and Corsica (Calvi), at a frequency of one service on Friday and on Saturday, during the period from June, 1953 to October, 1959.

Application No. 107 for a Seasonal Inclusive Tour service with Dakota aircraft for the carriage of passengers between Southend and Majorca (Palma) with an intermediate traffic stop at Corsica (Calvi), at a frequency of one service weekly, during the period from June, 1953 to October, 1959.

Application No. 108 for a Seasonal Inclusive Tour service with Dakota aircraft, for the carriage of passengers between Southend and Majorca (Palma), at a frequency of one service weekly, during the period from June, 1953 to October 1959.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections which may be raised to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [0053

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SENIOR spares schedule clerk, capable of taking charge of compilation section, required by Percival Aircraft, Ltd., Luton Airport, Beds. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Personnel Manager, stating age, experience and salary required. [0967]

ASSISTANT chief designer for company in South-West manufacturing aircraft equipment. Wide experience in design of precision mechanisms and instruments and general aircraft background essential.—Applications, detailing experience, qualifications, salary required, etc., to Box 3061. [0959]

LANCASHIRE AIRCRAFT CORPORATION, LTD. (Skyways of London), are now appointing additional navigating officers for their York fleet.—Applications from holders of appropriate M.C.A. licences should be made in writing to the Personnel Manager, Bovingdon Airport, Herts. [0960]

D. NAPIER AND SON, Ltd., Luton Airport, Beds., require a junior engineer familiar with aerodynamics, and preferably with some aircraft works experience; Higher National Certificate standard.—Please apply to the above address, quoting full details of experience, qualifications and salary required. [0948]

MECHANICAL engineering draughtsmen. Experienced men, preferably—although not necessarily—with aircraft experience, required for work associated with modern aircraft design.—Write, stating age, experience, salary, etc., and quoting reference MD/3, to Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.O.W. [0946]

DEPUTY chief inspector required by company manufacturing precision equipment for aircraft pressurisation, etc. Applicants must have first-class inspection experience on similar work. The position holds monthly staff status and is superannuated.—Full particulars with age, experience and references, to Box 3059. [0914]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouse, Wolverhampton. [0942]

DRAUGHTSMEN of H.N.C. standard with instrument or precision engineering experience required for aircraft pressurizing air conditioning work at London office.—Applications, with full particulars and salary required, marked "London," to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. [0784]

DEVELOPMENT engineers, designers, draughtsmen, technicians, technical writers, technical illustrators and technical assistants required for aircraft pressurizing high altitude breathing, etc.—Fully detailed applications with salary required, to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. Local interviews arranged where convenient. [0785]

VACANCIES exist for engineer or physicist with a degree or Higher National Certificate for field trials team in connection with guided missiles. Applicants must be prepared to travel.—Apply, stating age, qualifications and experience, to the Staff Manager (Ref. SS/JP.1), G.E.C. Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middlesex. [0956]

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities, including staff pension scheme.—Applications, stating qualifications, experience, age and salary required, to Personnel Manager. [0799]

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds, several draughtsmen with comprehensive experience of engine installations and allied systems. Good welfare facilities, including staff pension scheme.—Applications, in writing, stating age, qualifications, experience and salary required, to the Personnel Manager. [0801]

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APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aeronautic design desirable, but not essential. Also checkers. —Please write, stating age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0930]

IMPORTANT Midlands gas turbine aircraft engine manufacturer has vacancies for a number of designer and senior and junior draughtsmen. Although gas turbine experience is most advantageous it is not necessarily essential as training will be given in this specialised work to suitably qualified draughtsmen.—Apply, in some detail please, to Ref. F101, Box 3227. [0916]

ENGLISH ELECTRIC have vacancies for aircraft draughtsmen at Warton Aerodrome, near Blackpool. Men with good aircraft drawing office experience are invited to apply for these interesting positions which carry good salaries.—Write, giving full details, quoting reference 1218, to Central Personnel Services, the English Electric Co., Ltd., 336/7 Strand, London, W.C.2. [0940]

AERODYNAMICIST required for work on aircraft gas turbine engines. Degree, preferably with aerodynamics as one subject. The successful candidate is required to investigate and apply airflow theory to the design of gas turbine engines and previous experience in this or an associated field is very valuable. Please write, giving age and stating full details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0971]

RESEARCH engineer required for position in charge of section engaged on analysis of guided weapon flight tests. Successful applicant will be considered for similar work in Australia. Applicants should have a degree or equivalent qualification and a knowledge of aerodynamics. Precious experience of guided weapon work is not essential.—Please reply, quoting ref. 1083, to Central Personnel Services, English Electric Co., Ltd., 336/7 Strand, London, W.C.2. [0941]

ARMSTRONG SIDDELEY MOTORS, Coventry, have vacancies for technical assistants interested in the flight development of gas turbine aero engines. The work covers all aspects of engine performance, prediction, flight analysis, and associated problems on both turbojet and turboprop engines. Preferably, applicants should have reached an engineering degree or similar standard. —Reply in first instance to Personnel Manager, Armstrong Siddeley Motors, Coventry. Ref. PS.1. [0942]

ROLLS-ROYCE, Ltd., Glasgow, invite applications from young qualified engineers for a vacancy as a technical assistant in their technical services department. This vacancy requires a knowledge of piston or gas turbine aero engines, and the successful applicant must have as a minimum requirement H.N.C. plus two years' practical experience.—Reply, giving full particulars of age, experience, technical qualifications and salary required, to the Personnel Manager, Rolls-Royce, Ltd., Hillington, Glasgow, marking applications TE/1. [0944]

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APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero-engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [8032]

INTEGRAL, Ltd., Birmingham Road, Wolverhampton, invite applications for vacancies on the staff in the design and development department for interesting work on aircraft hydraulic mechanisms. Experience of aircraft component design or testing and good technical qualifications are an advantage.—Will applicants please state age, qualifications, details of experience and salary required. [8054]

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THE de Havilland Aircraft Co., Ltd., will shortly be opening a drawing office at their Chester factory and there will be vacancies for senior and intermediate draughtsmen who are experienced in the design of aircraft structures, electrical and engine installations, also customers' special requirements for civil aircraft.—Apply in writing, giving records of experience, age, etc., to the Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [8020]

SENIOR technical assistant required for engine technical office. Knowledge of engine stress calculations and mechanical testing (including vibration analysis) desirable. B.Sc. and/or A.M.I.Mech.E. preferred.—Please write giving age, previous experience and qualifications in chronological order to: The Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [8060]

JUNIOR stressman required by Flight Refuelling, Limited. Qualifications, engineering degree or H.N.C. Exempt from military service. Opportunity for keen young man to take part in an interesting development programme. Good salary. Excellent working conditions. Sports club. Possibility married accommodation adjacent airfield later. Cheap, fast transport Bournemouth and Poole areas.—Reply, giving details of age, qualifications, experience and salary expected, to Personnel Manager, Tarrant Rushton Airfield, Nr Blandford, Dorset. [8067]

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SENIOR assistant is required for work in connection with flight trials and assessment of airborne radar equipment. Candidates should have experience of radar or similar work in the laboratory or of using radar in the air, preferably under operation conditions in the R.A.F. A degree, Higher National Certificate or similar qualification is required.—Apply to the Staff Manager (Ref. 8/8/(K.1)), G.E.C. Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middlesex, stating age and record. [8058]

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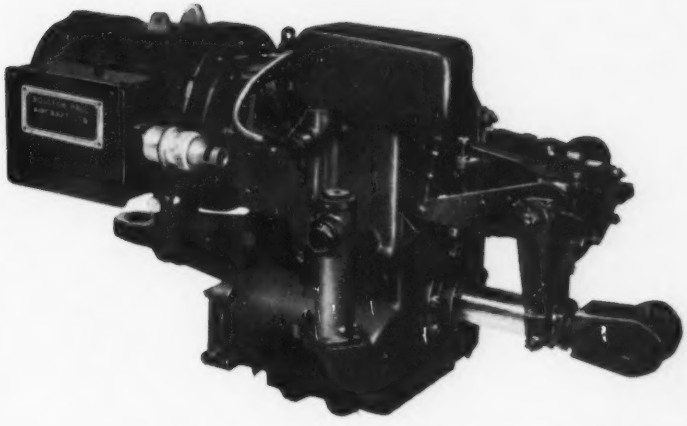

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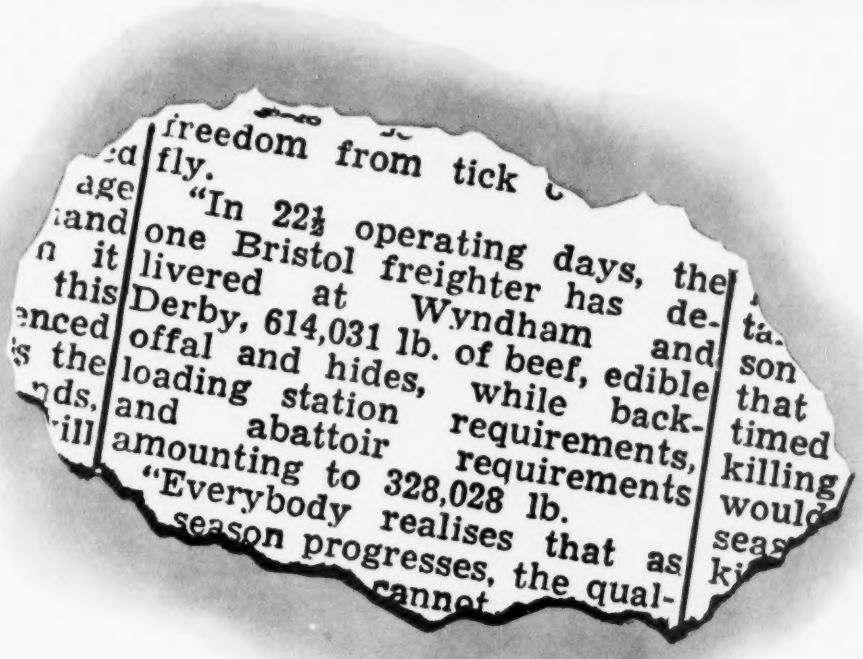

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